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COLLECTIVE REVIEW

THE ORTHOPTIC TREATMENT OF STRABISMUS

Review of the Literature from 1935 to 1939

PAUL T. McALPINE, M.D., New York, New York

THE orthoptic treatment of strabismus, for the years from 1935 through 1939, has engaged the interests of American and British workers mainly, although a few references are found in the literature of other countries. There is considerable unanimity of opinion in published reports as to the general worth of orthoptics, although the extent to which it should be used in the office and in clinic practice has not yet been agreed upon by investigators.

Orthoptics, of course, is not a new measure in the treatment of squint (10). Non-surgical measures were attempted as early as 1870. Javal and Remy were the pioneers, followed by Claude Worth. The stereoscope was the instrument used almost entirely by Javal, and, indeed, was all that was available until Worth developed the amblyoscope. Most authorities are agreed that the stereoscope has certain limitations for effective therapy. The limitations of the original amblyoscope were many, also, therefore, not until the more modern modifications of the stereoscope and amblyoscope became available (since 1914) did orthoptics begin to receive more general acceptance by ophthalmologists.

There is considerable agreement as to the purpose of orthoptics. Mayou (33) and Hicks (27) say that its purpose is to develop binocular vision. Davis (13) says that "orthoptics is a valuable and essential aid in the cure of squint." Peter (38) gives as the objects, "the restoration of vision, the correction of suppression, parallelism in visual axes, and the development of fusion." On the

other hand, Daily (12) considers orthoptics as an aid to surgery and uses it as such.

SELECTION OF PATIENTS

If binocular vision is to be obtained, Hicks (27) claims that the following conditions must be fulfilled: (1) there must be good monocular fixation and projection in each eye, (2) the visual acuity in the eyes must be approximately equal, (3) an image of approximately the same size and shape must be received from each retina, and corresponding retinal points must be able to function in association with each other, (4) there must be a large overlapping field of vision and only partial decussation of the optic tracts (in man as opposed to lower animals), (5) the neuromuscular mechanism of each eye must function normally alone and in association with the fellow eye, and (6) the higher cerebral centers must be fully capable of fusing the two monocular sensations.

The patients for orthoptic training should be selected, for there are certain contraindications to this type of training. Even so, Wurdemann (52) agrees with Cantonnet and Fillozat that orthoptics can cure 70 per cent of patients with squint, and Emerson (17) thinks that 75 per cent of the patients with squint are suitable for orthoptics. Bressler (10) lists the following factors to be considered in selecting patients suitable for orthoptic training:

1. Age, the patient should be at least seven or eight years old.

3. Degree of deviation the most favorable cases have less than 25 degrees in those with more than 35 degrees cure should not be attempted by orthoptics only

3. Visual acuity the deviating eye must have at least 20/65 vision, or in rare cases vision may be 20/100.

4. Excursion of eyes deviations due to paralysis or cicatricial contraction of the ocular muscles make the patient unsuitable for orthoptic treatment.

5. Degree of suppression If the suppression is very difficult to overcome, the prognosis will be poor

In addition the patient must be of average intelligence and must be willing to attend treatment sessions regularly. Gifford (19) and Guilford (23) consider 20/80 as the minimal visual acuity necessary in the squinting eye, Penman (37) considers it to be 6/18, and Sverdrick (46) 3/10. The last also lists the type of cases which he considers unsuitable for training. These include cases with loss of central fixation with paresis, with deviations of more than 30 degrees, cases of amblyopia of more than 5 D and of myopia of more than 10 D. We believe that many patients with the last two conditions may be helped by orthoptics and should not be excluded on this basis. Abraham (1) claims that fusion therapy should not be attempted with less than 20/70 vision in the poor eye because fusion developed in the presence of amblyopia is abnormal and may not be maintained.

STEPS IN ORTHOPTIC TREATMENT

Orthoptic treatment may be divided into the broad classifications of refraction the treatment of amblyopia, the treatment of false projection and suppression, and fusion training. It is assumed that before it is started a careful history has been taken and ocular examination including measurement of the deviation, has been carefully done.

Refraction. Travers (49) summarizes the accepted principles of refraction of squint. Convergent squint with hyperopia should be fully corrected. Astigmatism and myopia should be fully corrected also but divergent squint with hyperopia should be undercorrected. Refraction should be done under tropine. Gifford (19) advises following Guilford a method of treatment of the accommodative types of convergent squint by full correction and the use of a plaster bifocal for near work. The patient's eyes are kept under atropine, and fusion training is given at the same time.

The treatment of amblyopia. The principle of treatment of amblyopia is occlusion of the better eye. This may be partial, as with atropinization or frosted glass, or complete with an opaque occluder. The younger the patient is when treatment is instituted the better the chances are for success. Maivou (33) considers the optimum age to be five or six years. Goulden (30) and Worth say results of treatment are poor if the patient is more than six years old. Pugh and Jackson, more than twelve and Sattler more than fourteen (cited in 12). Peter (38) says that amblyopia ex anopsea can be cured in most patients up to the age of seven and that cures diminish up to the age of twenty. Dally (12) believes that it is not so much the age that causes the poor results as the difficulty of maintaining occlusion in older children. He uses continuous total occlusion until the vision is 20/40 and then partial occlusion. Lyke and Jackson (3) Pugh (41) and Travers (49) advise complete continuous occlusion for higher degrees of amblyopia (6/18 or less). Gifford (19) was unsuccessful in obtaining complete occlusion, finding it impossible when vision was less than 20/200. He advised occlusion for from one to two hours a day and atropinization of the good eye. Dally (12) and H'iz (28) did not find atropinization of the good eye of value in improving vision unless the vision in the poor eye was at least 20/50. A lone dissenter was Wurdemann (5) who found constant occlusion of little avail. He advised exercising the amblyopic eye with test letters.

The results of treatment of amblyopia ex anopsea are encouraging. Davis (13) found that 37 per cent of 46 clinic amblyopic cases and 81 per cent of 15 private cases improved (as was shown by the ability of the patient to read 2 or more lines more than he had before treatment was instituted). Penman (37) reports that of 4 patients in whom occlusion was done 35 showed improvement to a visual acuity of 6/9 or better and of 143 patients in whom occlusion was done for three months at the Royal Westminster Ophthalmic Hospital, only 14 showed no improvement. Berens (4) studied 85 private and clinic patients. Fifty seven patients were between the ages of three and eight 18 between the ages of nine and twelve and 10 between the ages of thirteen and twenty-one. Vision was improved in 36 or 63 per cent of the first group, in 1 or 67 per cent of the second group, and in 5 or 50 per cent of the last group.

False projection. False projection has been defined by Bleichowsky (7) as "a functional adaptation of the sensory apparatus to the abnormal position of the eyes relative to a fixed object

by Pugh (41) is "a mental reorientation of the displaced image", and Worth says that "the mind sometimes learns to make full allowance for the faulty position of this (the deviating) eye. So that the eccentric image, formed in the deviating eye, is mentally projected to the same spot as the true macular image, formed in the normally directed eye, and is blended with it." Verhoeff (50) prefers the term anomalous projection and defines it as "a type of binocular projection in which there are no corresponding visual axes, or as a type of binocular projection without retinal correspondence."

There is a high incidence of false projection. Smith (45) estimates that over 50 per cent of the patients with convergent squint have it (64 of 177 patients). Travers (49) found an incidence of 40 per cent in 154 patients, Bryant (11) found it in 50 per cent of 200, and Mayon (33) found it in 50 per cent of 300.

The diagnosis is most readily made on one of the easily adjustable major amblyoscopes, the synoptophore, or a similar instrument (45). The true angle of the patient's deviation is determined by screening, either with prisms or on the instrument. Two dissimilar test objects are then placed before the patient's eye at this angle. If projection is normal the two images will be superimposed. If false projection is present, the two images will be separated. The instrument is then adjusted so that the images become superimposed or approach each other as near as possible without crossing over and the difference in prism diopters between the objective and the subjective angles is noted. "If this discrepancy is greater than 5 prism diopters, the diagnosis of false projection is justified" (45).

The actual treatment (as practiced by all workers) for the re-establishment of normal projection is the simultaneous stimulation of both maculae. This is best carried out on a synoptophore, or like instrument, and consists of presenting images to both maculae with the arms of the instrument set at the true deviation. These are manipulated in any manner which will attract and hold foveal fixation.

Pugh (42) makes this general statement as to the possible effects of false projection: "If a patient's eyes are straightened by operation while he is still using false projection, he may after operation do one of three things, (a) He may, finding the visual axes parallel, develop a true projection and fuse with his eyes straight, (b) He may pass through a transitional stage when he learns to readjust his projection so that he eventually adapts himself to the new position of the

eyes. During this stage there is a false diplopia, (c) He may show no signs of modifying his false projection, but retain it. Such a patient suffers from a troublesome false diplopia and in his efforts to overcome this symptom he reverts more or less to his original deviation."

Smith (45) found that many of the failures in the operative cases of squint at the Wilmer Ophthalmological Institute might be attributed to lack of restoration of normal projection before operation. In 30 cases operated on before false projection was corrected, the eyes of only 4 patients remained straight, while in 10 of those operated on after false projection was corrected the eyes of 17 remained straight. Dohl (12), also, believes that false projection accounts for most of the poor surgical results. Berens (4) states, "It has been my experience that, unless true projection takes place before operation, the same degree of deviation which existed prior to intervention may recur."

Nevertheless, in certain cases in which normal retinal correspondence could not be developed pre-operatively, operation followed by continuous orthoptic training was apparently of benefit in producing normal retinal correspondence. Of 126 clinic patients, 33 (25%) had false projection before orthoptic training while only 13 (10%) had false projection following. "In the orthoptic department of the New York Eye and Ear Infirmary at the present time, treatment is successful in restoring true projection in about 85 per cent of the cases of false projection. On the other hand, Travers (49) met with very discouraging results in the treatment of false projection and believes that operation is the only method which has given any satisfactory results. Anderson (2) was successful in restoring true projection in only 33 per cent of 33 patients.

The length of time that patients are treated for the development of true projection and the age at which they are treated is not always stated. Also the frequency with which patients receive treatment, and the individual giving the treatment, are factors which have been stressed by Berens as possibly accounting for differences in the published results of treatment. His office patients (Personal Communication, 53) received daily treatment at home under the supervision of trained technicians both before and after operation, and the training periods sometimes lasted over a period of seven or eight years. Whether the patients were really trained, and the time when it is possible to train patients with abnormal retinal correspondence are all-important points. He believes the major amblyoscopes are the most useful instruments for this type of work.

The treatment of suppression. After amblyopia and false projection have been treated, suppression must be considered. Suppression may be present without having been preceded by either of the former conditions. It may be complete or partial and may be a matter of intensity as well as area (31) that is the patient may fuse the gross details of the two slides (49) but may suppress certain finer details. For example in slides of a horse with spots, he might see the outline of the horse readily enough but suppress some of the spots.

Diagnosis may be made by means of slides in the synoptophore with the arms of the instrument set at the patient a angle of squint only one of the slides will be seen and not the other. Or the Worth 4-dot test (31) may be used. In this test four panes of glass are arranged in a diamond formation illuminated from behind. The two lateral ones are green, the upper one red, and the lower white. The patient wears a red glass in front of one and a green glass in front of the other eye. The test is made with the patient at 5 meters. If he has single binocular vision he will see four lights, two green, one red, and one a mixture of greenish red. If he has binocular vision but his visual axes are not parallel he will see five lights, three green and two red. If he is suppressing with one eye he will see either three green or two red lights according to which eye is being suppressed.

Berens (5) has recently modified this test, particularly for use with small children. Three characters, an elephant, a sail boat, and a child with outstretched arms, are used instead of the round dots.

Treatment of suppression, as in that of false projection, is directed toward the simultaneous stimulation of both maculae. This is most conveniently done with one of the major amblyoscopes (4). The instrument is set at the true angle of the squint and the patient directed to look with both eyes at dissimilar pictures, such as an ant and a garage. The light may be dimmed before the fixing eye and increased before the suppressing eye. The slide before the suppressing eye is moved and the arm of the instrument moved backward and forward so that the image is constantly crossing the macula. Occlusion of the suppressing eye may be carried on along with other treatment. Drawing with the cheiroscope (31) is also of value in overcoming the suppression.

The development of fusion. Worth a gradation of binocular vision is generally used. The first stage is simultaneous macular perception with

normal projection. As Travers (49) points out, it is not enough to say that the first stage of binocular vision is simultaneous macular perception because many cases of false projection have this and yet do not have the first stage of binocular vision. The second stage is fusion of similar images, the blending of similar images by the two eyes into one. The third is stereoscopic vision, the blending of slightly dissimilar images with depth perception.

The instrument most favored for fusion training is one of the major amblyoscopes, the synoptophore or orthoptoscope (41 49, 31 33). The stereoscope is advocated as a training instrument by Guilbor (25) Gifford (19) and Russell (43) but Brauser (10) and Peter Wilkinson, and Wells (39) believe that the stereoscope has only a limited place in orthoptics. Other instruments which may be of aid are the cheiroscope, the myoscope, the diploscope, and several varieties of stereoscopes (31).

There is general agreement that the actual orthoptic training is best carried out by trained technicians under medical supervision (10) and that the treatments should be individual and not group treatments. Three treatment periods of thirty minutes each are advised (1 31), although daily treatments are to be preferred (22) particularly postoperatively. Home treatment is generally unsatisfactory and is limited to patients who have true projection as an adjunct to office training to break down suppression and to develop fusion after it has begun.

The technique as advocated by Lyke and Jackson (31) is as follows:

The slides used in the amblyoscope for the development of first-grade fusion have been described. They are of dissimilar objects, such as a lion and a cage. Those used for second-grade training contain similar objects with one or two dissimilar details, e.g. a cat with a tail missing in one slide and ears missing in the other. When a single cat with ears and tail is seen one knows the patient is fusing the two. However, Feldman (15) believes that second-grade fusion is best developed by the use of color slides e.g. yellow and blue cards. Gifford (19) found that simple figures showing perspective and not flat pictures were the easiest to fuse such as found in the Wells

E series, and Guilbor's cards. Once the second stage has been reached "amplitude" is worked for i.e. the patient is urged to keep the two images together while the arms of the instrument are moved to introduce prism base in or out. It is important also in accommodative squints to train the patient to dissociate accommodation and convergence. This is done by having him go

without his correction during training periods and to practice "seeing misty" as he would with relaxed accommodation. Third-grade fusion or stereopsis is developed by having the patient study stereograms in the amblyoscope or stereoscope and having him try to see differences in depth.

ORTHOPTICS AND SURGERY

While it is not within the scope of this review to consider the surgical correction of squint, the relationship of orthoptics to surgery should be mentioned. Indeed, surgery may even be considered a part of the orthoptic treatment. Certainly the treatment of squint would be inadequate if one were confined to the use of either measure. Mayou (34) says that squints of more than 10 or 15 degrees, or postoperative deviations require surgery. Post (40) advises surgery before orthoptic training if the deviation is more than 15 degrees. He says nothing of amblyopic training. Lyle and Jackson (31) list among indications for operation abnormal retinal correspondence (false projection) which is uncorrected by 24 orthoptic treatments, intractable amblyopia (cosmetic results only) and no fusion sense. Berens (6) thinks surgery is advisable if the deviation is too much for orthoptic and optic correction, if symptoms are only partially relieved by lenses and prisms, or if the underlying causes have been removed and the condition remains stationary.

RESULTS OF ORTHOPTIC TREATMENT

The lack of uniformity in reporting cases which have received orthoptic training makes comparisons of the results of the various workers difficult. Obviously, all reports of the past five years cannot be tabulated in this review so an attempt has been made to list the larger series and those which contain records of the state of fusion.

Hicks and Hosford (27) found that among 24 cases of esotropia treated surgically but without orthoptics, fusion developed spontaneously after operation in 16, or 66 per cent. Among 36 cases receiving orthoptic training only, fusion was developed in 25, or 69 per cent.

Anderson (2) reports the following

24 cases of esotropia averaging 14 degrees with true projection—17 (71 per cent) cured after orthoptic treatment only

10 cases of esotropia averaging 22 degrees with true projection—5 (50 per cent) cured after orthoptic and surgical treatment

4 cases of esotropia averaging 22 degrees with true projection—2 (50 per cent) cured after surgical treatment only

Cure-phoria less than 5 degrees and third-grade fusion

Berens (4) reported the results in the treatment of 223 cases of squint. Forty-nine patients received surgical treatment only. After operation 46 still had heterotropia and 3 had heterophoria and second-grade fusion. Eighty-five patients, 70 with esotropia and 15 with exotropia, received orthoptic training following surgery. Before treatment some degree of fusion was present in only 21 (24 per cent). Following surgery and post-operative orthoptic training some degree of fusion was present in 52 (61 per cent). Heterotropia persisted in 47 (55 per cent). Eighty-nine patients, 74 with esotropia and 15 with exotropia, received orthoptic training before and after surgery. Prior to treatment some degree of fusion was present in 38 (43 per cent). Following pre-operative and postoperative orthoptic training some degree of fusion was present in 65 (73 per cent). Heterotropia persisted in 37 (42 per cent).

Vorisch (51) treated 245 patients with esotropia who were less than thirteen years of age by means of atropine, occlusion, and correction of the refractive error. One hundred and eighty-three (75 per cent) were monocular and 62 (25 per cent) were alternators. Of the 245, 109 (44 per cent) were cured, 68 (28 per cent) were benefited, 37 (15 per cent) were not benefited, and 31 (13 per cent) presented a worse condition after the treatment.

Mayou (34) reports 93 cases of divergent strabismus among 800 consecutive cases of squint and considers squints of less than 10 or 15 degrees or periodic squints as curable by orthoptics.

Bressler in a study of 2 series of cases found the results to be as shown in the table appearing on Page 6.

Guibor (23) studied two groups of squint cases. The first group consisted of 148 patients who were treated by correction of the refractive errors, atropinization of one or both eyes, and occlusion of the fixing eye, but they received no fusion training. The second group consisted of 65 patients who received the same treatment plus fusion training. In Group 1 recovery occurred in 70 per cent of those with the accommodative type of esotropia and in 74 per cent of those with the accommodative amblyopic type, but in only 9 per cent of those with squint associated with fusion defects and 15 per cent of those with squint associated with amblyopia. There were no recoveries in the cases of squint associated with muscular defects and muscular defects with amblyopia. In Group 2, 83 per cent of the patients with accommodative squint recovered (70 per

TABLE I—RESULTS IN CASES OF SQUINT

	Pre-operative				Postoperative			
	Number of cases		Percentage		Number of cases		Percentage	
	Series	Series	Series	Series	Series	Series	Series	Series
Group (Operative treatment) Series 1—42 cases (a) Series 2—150 cases (b)								
Deviation Straight		17%		100	41	43	3	31
Not straight								
Fusion None		30		100	32	34	29	61
Fusion					6			8
Group (Surgery and orthoptics) Series 1—30 cases Series 2—2 cases								
Deviation Straight	3		8	6	16		17	47
Not straight	24	30			43	17		53
Fusion None	30	30	88	94	38	8	64	
Fusion						34	36	75
Group (Pre-operative and postoperative orthoptics) Series 1—20 cases Series 2—20 cases								
Deviation Straight					17	30	43	38
Not straight	20	34	100	100		36	38	64
Fusion None	14	34	60	34	13	7	37	
Fusion	16	7	20	66	29	24	73	34

Series 1(a)—kind of squint not stated
Series 2—17 cases of esotropia and 27 cases of exotropia

Apparently refers to deviation after surgery and before orthoptics.

cent, Group 1) 40 per cent of those with the amblyopic type of squint (15 per cent, Group 2) 15 per cent of those with a muscular defect (0 Group 1) and 22 per cent of those with muscular defects and the amblyoscopic type of squint (0 Group 1).

A National Orthoptic Board has been appointed at the suggestion of the American Committee on Optics and Visual Physiology and orthoptic training technicians are now certified by this Board. This has been one of the factors which is leading to greater acceptance of orthoptic training. Since technicians and equipment have been available in certain of the large hospitals, for example, the New York Eye and Ear Infirmary, Johns Hopkins Hospital, Wills Hospital, and Illinois Charitable Eye and Ear Hospital men are having a better opportunity of becoming acquainted with the use of certain instruments and the methods of managing certain types of heterophoria and heterotropia.

There has been an awakening of interest in orthoptics in the past six years but there is a need for careful reports of the results obtained. This is true particularly in reference to false projection, concerning which relatively little has been reported.

I wish to express my appreciation to Doctor Conrad Berens for his helpful suggestions in preparing this review, and to the Ophthalmological Foundation, Inc. for secretarial work.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

EYE

Gifford S. R.: The Treatment of Secondary Glaucoma. *Arch. Ophth.*, 1940, 3, 30

The author points out that the treatment of secondary glaucoma, even more than that of primary glaucoma, is a matter of individualization. Judgment and experience are required as in few other conditions, together with versatility and the courage to follow out clinical indications without loss of time.

Most important is early recognition of the condition, for which nothing is more essential than use of the tonometer in every case in which the possibility of glaucoma exists.

Miotics are useful, and it would seem that mecholyl may prove valuable recent addition to this category.

Epinephrine and its derivatives, though dangerous during active iridocyclitis, are often of value in glaucoma following cataract extraction or dislocation.

The intravenous injection of hypertonic solutions is exceedingly useful, it may be the means of aborting an acute attack and will usually allow operation to be performed under relatively favorable conditions. It will obviate resort to paracentesis in many cases.

Operative intervention is often necessary and should be promptly employed when tension cannot be controlled by other means. The operations which proved of greatest value in this series were iridectomy for glaucoma following uveitis and cyclo-

dialysis for glaucoma following cataract extraction or dislocation.

LESLIE L. MCCOY, M.D.

Troncoso M. U.: Cyclodialysis with Insertion of a Metal Implant in the Treatment of Glaucoma. A Preliminary Report. *Arch. Ophth.* 1940, 3, 179.

Troncoso makes real contribution to ophthalmology in this well written and well illustrated article, and backs it up with clinical and experimental research. He concludes thus:

To improve the results of cyclodialysis in the treatment of glaucoma, I have implanted strip of magnesium in the wound between the ciliary body and the sclera. Magnesium is absorbed by the tissues, giving off bubbles of free hydrogen, in about twenty days. The presence of the metal and the bubbles of gas prevent the reattachment of the ciliary body to

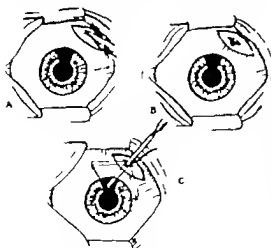


Fig. 1 Medicated technique of cyclodialysis for secondary glaucoma.

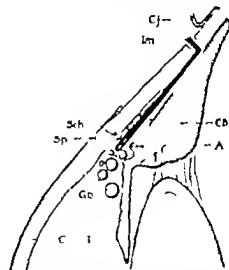


Fig. 2 Schematic representation of the angle of the anterior chamber and the vicinity showing the cyclodialysis operation. The implantation of magnesium in as *cj* with an open angle. The ciliary body, *Cb*, has been already detached from the sclera as far as the scleral spur *Sp*. The point *A* shows the insertion of the ciliary body opposite to the spur. *Sc* indicates Schlemm canal, *Cj*, the cornea, *I*, the iris, and *Cj*, the conjunctiva. The magnesium implant, *Im*, is already in place and its lower tip reaches the anterior chamber just beyond the insertion of the ciliary body. The water rod is bent square to prevent it from sliding into the anterior chamber and also to raise the conjunctiva. Gas bubbles, *Gb*, of different sizes are shown in the anterior chamber and along the tunnel made by cyclodialysis.

the sclera, thus affording a new way for the outflow of the aqueous to the perichoroidal space. Experiments with animals and microscopic sections have shown that a lacunar scar is formed between the anterior chamber and the suprachoroidal space, ending in a thin scleral cicatrix. No complete channel was ever found.

"Implantation of magnesium after cyclodialysis was made in 12 human eyes with subacute, chronic congestive, simple or congenital glaucoma. There was at first a mild reaction to the foreign body, with numerous bubbles of gas appearing in the anterior chamber and under the conjunctiva. The reaction subsided in about one week, and the nictal was entirely reabsorbed at the end of twenty days. Clinical results have been good in the majority of cases, in others there was improvement with diminution of hypertension, and in 1 case no improvement occurred. The method is harmless and can be repeated several times in the same eye."

LISLE L. MCCOY, M.D.

Smithers, D. W. The X-Ray Treatment of Malignant Tumors in the Region of the Eyes. *Brit J Ophthalmol*, 1940, 24, 105.

The effect of x rays on the eyes and the radiation methods of treatment of malignant growths in the vicinity of the eyes are discussed briefly. Previous methods of eye protection are referred to and new lead covered contact "perspex" shells for protection of the eyes in short distance low voltage x ray treatment are described. The advantages of this form of x-ray therapy and the results obtained in the treatment of tumors of the lids and canthi during the last four years at the Royal Cancer Hospital are discussed.

There is no part of the body in which greater care and accuracy are necessary in the radiation treatment of malignant tumors than the region surrounding the eyes.

The effects of radium and x rays on the eye are essentially the same and there is an absolute relationship between the dose of radiation given and the pathological changes produced. The eyelids are slightly more radiosensitive than the surrounding skin of the face, and the conjunctiva slightly more radiosensitive than the eyelids. The cornea is distinctly less sensitive than the lids and conjunctiva, and the iris is less sensitive still. The retina and optic nerve are remarkably insensitive to irradiation. The lens, in adults, is not very susceptible to the effects of irradiation, but the late development of cataract is a serious complication that must be guarded against. There is little doubt, however, that cataract does occur as the result of irradiation, and that a five year latent period is not uncommon.

In x ray treatment, therefore, the immediate danger to the eye is severe conjunctivitis followed by corneal ulceration, and the late danger is the development of cataract. Treatment of tumors of the inner canthus may damage the lacrimal duct and result in troublesome epiphora.

Tumors which invade the eyeball or encroach upon the walls of the orbit are a problem apart, for their situation renders diagnosis to the eye as a result of treatment an unavoidable risk and a secondary consideration. Tumors of the eyelids or neighboring skin are in a different category and any injury to the eye in the treatment of such tumors should now be regarded as due to a serious error in technique.

Lid is the most effective shield, for the protection that it affords increases with the density and atomic number of the element.

LISLE L. MCCOY, M.D.

DeRotth, A. Plastic Repair of Conjunctival Defects with Fetal Membranes. *Arch Ophthalmol*, 1940, 23, 522.

Conjunctiva has to be replaced when a large enough area is destroyed so as to cause a high degree of symblepharon or entropion, or when the socket is too small to carry a prosthesis. Most common causes of its destruction are chemical and thermal burns and trachoma.

The ideal material for replacing conjunctiva is conjunctiva itself, but only a small piece can be taken from the same patient's other eye. Other tissues that have been tried are skin, mucous membrane of the mouth, vaginal mucous membrane, vernix caseosa, and grafts from the prepuce or labia minora, but none have proved entirely satisfactory.

An ideal material for this purpose should be a thin, smooth, transparent human tissue like the conjunctiva, it should be sterile and obtainable in a sufficiently large amount.

Fetal membranes seem to have all these requirements, in addition, they are elastic and carry but few vessels, and the patient does not have to undergo another operation. The author obtained such membranes by cesarean section. The membranes were kept in tepid Locke solution from one to fifteen hours. He used this material in 6 cases of symblepharon (8 operations) and in 2 cases in which the socket had to be enlarged.

Technique of the operation. The conjunctiva is undermined from the limbus to the margin of the lid. The undermined conjunctiva is fixed to the lid with two or three mattress sutures to build the palpebral conjunctiva. The graft is fixed to the tendon of one or more rectus muscles, which gives a fixed point on a firm base and avoids shrinkage. The graft covers the fornix, and its edge will unite with that of the conjunctiva lining the lid. The graft is not allowed to make folds but just covers the sclera and fornix smoothly.

When fetal membranes are used the chorion surface is placed on the wound following removal of tense fibers of connective tissue, if any are present. The amnion forms the free surface. In all cases a binocular dressing was applied for three days when the bandage was first changed.

The method deserves further study for the following reasons:
1. The embryonal tissue used has the property of being transformed to conjunctiva. The epithelium

of the membranes excised two and four months after transplantation showed the same histological structure—the epithelium of the bulbar conjunctiva.

2 In the successful case the course of the new vessels in the graft was like that of a normal conjunctiva. In no other form of graft may this be observed.

3 The fetal membranes covering the cornea resulted in a slightly transparent tissue. Whether it was the graft itself or whether the graft was replaced by normal corneal epithelium, the author does not know.

At present the author thinks the use of fetal membranes should be confined in conjunctival plastic operations to cases of symblepharon when for any reason mucous membrane of the mouth is not obtainable. Even when there is disease of the mouth, when the patient refuses operation in the mouth, and, further, when the symblepharon includes the cornea as well, for mucous membrane of the mouth gives a poor cosmetic effect when covering the cornea.

LESLIE L. MCCOY, M.D.

Davidson, M. *Lens Lesions in Contusions. A Medicolegal Study*. *Am J Ophth* 949, 3, 5.

The author says, "This study deals only with the permanent lesions of the lens due to contusion."

Lens lesions from contusions give rise to frequent controversies in the administration of workmen's compensation. A survey of the problem as it presents itself in actual practice is here attempted in the form of a brief review of the literature, and of an analysis of the material dealt with in the past one and one half years at the Bureau of Workmen's Compensation of the New York State Department of Labor.

While lens opacity and cataract are generally used as synonyms for statistical and medicolegal purposes, and particularly for the peace of mind of patient or claimant for compensation, the use of the term cataract to describe all kinds of lens opacities, regardless of their effect on visual acuity or fundus visibility or probable evolution, is confusing and highly undesirable. The writer uses the term "cataract" in this paper to describe lens opacity only when it is so complete as not to permit an examination of the fundus.

He comes to the following conclusions:

The use of the term "cataract" to describe all kinds of lens opacities regardless of their extent and effect on visual acuity is confusing and gives rise to misunderstandings. It should be restricted to designate complete lens opacifications.

Our pre-slit lamp knowledge of the lens was meager and imprecise and the textbooks and literature of that period reveal too considerable confusion and uncertainty in dealing with the medicolegal aspects of lens opacities and cataracts due to contusions to be invoked with propriety in medicolegal controversies.

3. The slit-lamp has taught us to recognize the specific ages of lens zones, the specific morphology of the results of mechanical injury, the fact of "retroso-

data" or traumatic and has furnished us with a biomicroscopic technique of equal value with the histologist technique. It has dispelled some previous misconceptions as to the rôle of ruptures of the posterior capsule from contusions and established their rarity; of macroscopic ruptures of the anterior capsule found also to be rare; and of ruptures of the equatorial capsule similarly non-demonstrable as it has served to call our attention to the biochemical rôle in the production of lens opacification, along with the mechanical factors in contusions. It has also enabled us to verify the activation of present and pathological processes in lens resulting from contusion.

4. An analysis of the examination of 57 eyes with contusion lens opacities of wide variety of ages establishes a morphological specificity of juvenile and adult contusion lesion up to the age of forty-five years, on the basis of subcapsular beginning, the tendency toward equatorial and posterior lens involvement, and regional segmentlike localization. It shows that after the age of forty-five years such pathological changes intervene to make less discernible the specific morphology of contusion lens opacity.

It is not possible to designate the age of lens opacity with any accuracy from its depth alone because of the widely varying rate of recession in depth that has been observed. The density of an opacity resulting from compression, course of time is a more important clue than depth, but it is difficult to measure accurately.

5. The prognosis of contusion lens opacities occurring before the age of thirty is good. After that age, it should be guarded and the lesion not declared stationary until a period of observation of three years has passed, in order to take care of statistical limitation in the administration of workmen's compensation and protect the claimant against future deteriorations.

It could be well for physicians to be confronted with medicolegal cases to study carefully this very detailed, well illustrated, and scientific treatise.

LESLIE L. MCCOY, M.D.

EAR

Selfridge, G. *Chronic Progressive Deafness with Special Reference to Estrogenic Substances A Further Contribution. I*. *Urol. Res.* 949, 49, 3.

Selfridge believes that estrogenic substances probably play an important rôle in conductive deafness. Estrogen relieves completely in many cases the thymus menstrual irregularities and other symptoms occurring during menstruation. Unfortunately these symptoms recur in many instances when estrogen is discontinued. There is definite evidence that thyroid as well as pituitary and adrenal cortex is of importance in treatment. Thiamin chloride and nicotinic acid has been found to be helpful, while other factors of the B₆ complex, together with their vitamins, appear to be of use.

Neither nerve deafness nor conduction deafness is caused by any single factor, but it appears to be linked with the various factors related to growth, i.e., endocrine glands, vitamins, mineral salts (the electrolytes), and amino acids. The slowly accumulating evidence points to nutritional deficiencies, and the beginnings probably occur during the period of gestation and are due chiefly to dietary errors and endocrine disturbances of the pregnant mother. The prevention of deafness, therefore, depends on the mother's getting an optimum diet containing all the essential foods during the gestation period, and such dietary habits must be carried on during babyhood, childhood, and adolescence.

Finally, the author asserts that further work is necessary concerning the various factors referred to in this and other papers already published, and especially the nutritional, endocrine, and allergic factors that may prove to be related to the enlargement of tonsils and adenoids.

NOAH D. FABRICANT, M.D.

Harris, H. E., and Moore, P. M., Jr. The Use of Nicotinic Acid and Thiamin Chloride in the Treatment of Ménière's Syndrome. *Med Clin North Am*, 1940, 24, 533.

The authors found a history of dietary deficiency in their cases of Ménière's syndrome. Neither thiamin chloride nor nicotinic acid alone benefited their patients but combination of the two was beneficial. They give 10 mgm. of thiamin chloride twice a day, and 50 mgm. of nicotinic acid five times a day. Post-nicotinic acid flushing is not a contraindication. In addition, from $\frac{1}{2}$ to $\frac{3}{4}$ pound of rare red ground meat, $\frac{1}{2}$ pound of liver three times a week, wheat germ, raw vegetables, and raw fruit were included in the diet. Of 20 patients so treated, 17 are free of vertigo and the remainder are benefited, their hearing also has improved and the tinnitus has decreased. The recovery came gradually over a period of several weeks.

PAUL STARR, M.D.

Fischer, J. Changes in the Internal Ear Due to Increased Endocranial Pressure. The Histological Basis of Congestive Inner Ear. *Arch Otolaryngol*, 1940, 31, 391.

The question of whether changes in the inner ear, similar to choked disc in the eye, occur as a result of increased endocranial pressure has not yet been definitely answered. Likewise, the question of endocranial pressure itself is still in dispute. Differentiating between clinical symptoms and pathological anatomy due to chronic endocranial pressure, the author reports microscopic studies of the petrous temporal bone on 5 patients who died from brain tumor. Examination of these sections led to the conclusion that numerous changes in the inner ear are caused by chronic brain pressure. These can be classified into the following main groups:

1. Transudation, exudation, and lymphatic congestion within the membranous inner ear and the nerve ganglion apparatus.

2. Hyperemia (especially venous), hemorrhages, and alterations of the walls of the blood vessels within the inner ear and the petrous bone.

3. Formative changes within the membranous inner ear, in the ductus cochlearis, the ductus endolymphaticus, the ductus perilymphaticus, and the ductus reuniens.

4. Formations of hernias of the brain and pachymenian granulations.

5. Secondary (later) changes, pigmentations, attachments, and adhesions in the membranous inner ear, and ascending atrophy of the nerve ganglion apparatus.

6. Pressure atrophy of the bone due to osteoclasts and Volkmann's perforating canals, caused by herniations of the brain and pachymenian granulations.

Elaboration and a detailed discussion of these groups are then given, with a dissertation on the analogy between aural changes and choked disc as interpreted by the author. JOHN I. DILLON, M.D.

McKenzie, W. The Results of the Conservative Radical Operation or Attico-Antrotomy in 70 Cases. *J Laryngol & Otol*, 1940, 55, 75.

The problem of the treatment of chronic suppuration from the ear is one which occupies afresh each generation of otologists. If an ear, the subject of a chronic suppurative otitis media, will not clear up with conservative treatment, an operation is necessary, and the aims of this operation may be classed in order of importance: (1) the prevention of intracranial complications, (2) the maintenance of hearing, (3) the reduction and, if possible, the abolition of the otorrhea, and (4) the avoidance of prolonged hospital treatment.

The operation of attico-antrotomy with a meatal flap fulfils these aims, with the exception of the last. There is, of course, a risk of failure (in the author's series about 15 per cent), and this must be accepted. The first aim is fulfilled in both radical and conservative operations. The second can be said to be the particular province of those operations, which spare the middle ear. Evacuation of the contents of the middle ear cannot guarantee a dry ear. In this series with the middle ear intact, there are a number of dry ears, enough at all events to be encouraging. In those cases of this series classed as "moist," the discharge corresponds exactly with that described by certain authorities as occurring after a radical mastoidectomy and dismissed by them as of negligible importance. Finally the worst which can occur is a further operation, and conversion to a mastoid condition requiring radical treatment.

McKenzie suggests the following indications for this operation: (1) if the hearing in the affected ear is "good" or "fair," the middle ear should be spared and an attico-antrotomy done, (2) if the hearing is "poor" and the drum nearly intact with a posterior or attic perforation, the middle ear should be spared, (3) if the hearing is poor, and the drum is absent or not well seen, no decision should be reached until the middle ear is exposed at operation. If, on inspection

of the middle ear the ossicles are destroyed only then should radical mastoid operation be undertaken.

Regarding the question of the flap and the permanent cavity communicating with the meatus the natural question to ask is: Why have this at all? The reasons may be (1) that the posterior meatal wall may be torn at operation; (2) that to gain a view of the attic, and (3) that with adequate and skilled after treatment the postaural cavity epithelializes completely. The area is open for inspection at any time, and it is said that the likelihood of subsequent recurrence of disease is lessened.

The disadvantages of the flap operation are that the cavity is difficult to manage after operation, and it needs prolonged dressing and prolonged treatment, extending from month to six weeks. If failure occurs the area of the bridge may scar over and two cavities are left: one in the attic and middle ear and one in the mastoid. At the thor's hospital modification of this operation is practiced. With the modified technique the bone is removed as before but the flap is not cut. Only a window is cut in the membranous meatus, the end of the postaural pack being brought out through this. The postaural wound is closed entirely. Later the pack is removed under anesthesia and not replaced, the cavity being allowed to fill with granulation tissue.

Following operation 35 per cent of this series of cases were dry, 50 per cent moist, and 15 per cent were unchanged or converted into mastoid condition. The hearing was good in 34 per cent, fair in 30 per cent and poor in 36 per cent. The hearing was improved in 57 per cent, unchanged in 18 per cent and worse in 25 per cent.

W. M. D. FARRAR, M.D.

NOSE AND SINUSES

Smith, A. T. *Osteous Lesions of the Nose and Sinuses, with Special Reference to Hypertrophic Changes and Tumor Formations.* *Arch. Otolaryngol.* 940, 3, 59.

In study of hypertrophic changes and tumor formations in bone lesions of the nose and paranasal sinuses, Smith finds that in contrast to the well established gross and clinical features of the lesions there is great deal of existing uncertainty as to the pathological interpretation. The majority are treated as osteomas and are thought of as neoplasms. There is considerable confusion as to the term osteoma. To the pathologist it is a term under which he discusses many forms of overgrowth of bone. To the laryngologist it is a definite clinical entity for he considers it to be a tumor originating in the bone of the nose and sinuses, encroaching on the cavities, and giving rise to symptoms of deformity, displacement, obstruction, and pressure.

Osteoma as a true neoplasm has not been clearly distinguished from other forms of overgrowth of bone. It appears to be pathologically related to the

so called fibrocytic group of bone lesions. Because of the number of instances in which one finds that it combines the clinical features and histological characteristics of both giant-cell tumor and osteofibroma, the author believes they may be closely allied and the possibility of a common cause must be considered. Some form of trauma seems to be the most important causative factor. Some other metabolic or nutritional disturbance may be necessary to account for such a binomial reaction, and further clinical and histological investigation should be carried out to establish the basic nature of these processes. A better understanding of the causative factors may reveal that in the cases in which the lesion cannot be definitely proved to be a true neoplasm, radical surgical intervention with the attendant deformity in an attempt to eliminate the condition, is not necessary. W. M. D. FARRAR, M.D.

PHARYNX

Townshend, R. H. *The Formation of Passavant's Bar.* *J. Laryngol. & Otol.*, 940, 55, 54.

I 869 Passavant described a cross-ridge which appeared on the posterior pharyngeal wall during articulation—a subject with cleft palate. He claimed that it was essential for normal speech. The question was apparently not discussed further until Wa. H. Hill in 1928 announced that his colleague Williams had discovered the muscle fibers that crossed the ridge and the latter in 1930 gave his discovery the name of the "palato-pharyngeal sphincter."

Townshend's observations were made on a living subject with cleft palate and on dissection. He believes that Passavant's bar is obviously produced by the contraction of muscle fibers that arise from the palatalis frontalis and run back and horizontally to meet each other behind. These fibers are part of the palatopharyngeus muscle and blend posteriorly with the superior constrictor very soon after arising from the palatalis. A fascial plane may be present between the upper and anterior parts of the superior constrictor muscle and the palatopharyngeus muscle. This is probably the primitive condition and is tending to disappear. W. M. D. FARRAR, M.D.

NECK

Weill, H., Huguenin, R., and Du Sertout, X. M. A. *Contribution to the Study of Chronic Thyroiditis (Contribution à l'étude des thyroïdites chroniques).* *A. d'Endocrinol.* 939-940, 379.

Weill and his associates report 4 cases of chronic thyroiditis of the type described by Hashimoto in 1919 under the name of struma lymphomatosa. This type of chronic thyroiditis has rarely been described in French literature. It differs from sclerositis of the thyroid which causes few if any symptoms and is often found only at autopsy. It differs also from lymphocytic thyroiditis, described by Riedel, which is characterized by marked enlargement of the thyroid, often with infiltration of the surrounding tissues.

The type of chronic thyroiditis described by Hashimoto occurs almost exclusively in women, all the authors' patients were women, from forty-nine to fifty-six years of age. The enlargement of the thyroid developed rather rapidly in a gland that had previously been normal, the onset occurred either at the time of or after the menopause. In 3 cases, the thyroid enlargement was accompanied by signs of slight hypothyroidism, i.e., lassitude, apathy, and infiltration of the skin—2 patients showed a slight rise in temperature—one at the onset of the symptoms, the other later in the course of the disease. The consistency of the thyroid was softer than in Riedel's disease, and there was no involvement of the surrounding tissues. In the first 3 cases, the possibility of cancer was considered, but the mobility of the tumor, the absence of infiltration of the surrounding tissues, and the consistency of the thyroid enlargement were against this diagnosis, in the fourth case, the diagnosis of chronic thyroiditis of the Hashimoto type was based on the findings in the first 3 cases.

In all the authors' cases a total thyroidectomy was done, this operation is justified in this type of thyroiditis as the normal thyroid tissue is either entirely destroyed or only small remnants persist. In all of the cases it was necessary to administer thyroid extract after the thyroidectomy. In the first case, in which no symptoms of hypothyroidism were evident before operation, thyroidectomy was done in two stages, as symptoms of hypothyroidism developed after the first stage, it was necessary to give thyroid extract before as well as after the second stage.

Histological study of the thyroid in these cases showed the lesions typical of struma lymphomatosa, as described by Hashimoto and others, namely, sclerosis, atrophy of the glandular elements, and lymphoid infiltration. The lymphoid infiltration was of two types, either in the form of follicles, sometimes with germinative centers, or in the form of diffuse infiltration between the vesicles of the thyroid, in some areas the infiltrating cells were plasmocytes rather than lymphocytes. These lesions cannot be regarded as absolutely pathognomonic, as similar structures may be observed in "burned out" glands of exophthalmic goiter and in certain cases of thyroiditis of the Riedel type. The diagnosis of "struma lymphomatosa" depends upon the clinical picture as well as the histological findings. The essential clinical characteristics are the occurrence in women after the menopause, the absence of hyperthyroidism, and, on the contrary, a tendency toward hypothyroidism.

ALICE M. MEYERS

Wilson W. D., and Mayo, C. W. A Histological Study of the Thyroid of Exophthalmic Goiter at Intervals During the Administration of Iodine. *Surgery*, 1940, 7: 325.

One hundred cases in which exophthalmic goiter was treated with iodine and operated upon in stages have been studied histologically with a control group of 10 cases in which Lugol's solution was not given. The following conclusions were drawn:

- 1 It seems that in this series there was evidence of a tendency toward decreased activity or histological involution in the thyroid glands of the majority of the patients who were treated for long intervals by iodine in whom a change was noted, while there was some histological evidence of increased activity in the second stage in the glands of most of those treated for shorter periods in whom a change was seen.

- 2 There seems to be histological evidence of an increase in activity of the thyroid gland in exophthalmic goiter during the winter months.

- 3 The amount of colloid varies inversely with the "activity" of the thyroid gland.

- 4 The amount of regenerative hyperplasia in the gland varies directly with the "activity" of the thyroid gland.

- 5 That the histological observations made in this study are valid is suggested by the computation and coordination of the ratio of the basal metabolic rate to the weight of the thyroid substance removed.

Dargent, M., and Berard, M. Extensive Operation for Carcinoma of the Thyroid Gland (*De l'intervention élargie dans le cancer du corps thyroïde*). *J. de chir.*, 1940, 55: 131.

More than 100 cases of carcinoma of the thyroid gland were studied and form the basis for this paper. Thyroid cancer is divided into two large groups, namely (1) cancers which are of low-grade malignancy, and (2) cancers which are of high grade malignancy.

Thyroid cancers of limited malignancy may be removed radically even when complicated by bony metastases because after the removal of the primary tumor the patients live for ten years or more. The same type of patients in whom malignancy is found at the time of operation, but upon whom radical operation is not carried out, live but a limited time because of the extensive growth of the local cancer. The operation consists essentially of a very complete removal of the thyroid gland including all adenomas. The extension of the cancerous process to the ganglions, muscles, and aponeuroses of the neck, and the internal jugular vein is a bad omen because these parts act as proliferating centers for further extensions. The finding of these extensions suggested the very extensive type of operation which the authors recommend. Roentgen therapy is only moderately effective in the low grade cancer of the thyroid, which is rather resistant to irradiation.

The authors suggest and practice the removal of the sternomastoid muscle and its superficial aponeurosis, the omohyoid and infrahyoid muscles and the middle aponeurosis, the internal jugular vein, the superior thyroid artery, and all of the tumor in one mass.

In the first case the patient presented an atypical epithelioma, and extensive removal of the tumor, blood vessels, and muscles was carried out. In the second case a papillary epithelioma was found and extensive removal of the tumor, muscles, ganglions,



Fig. 1.



Fig. 2.



Fig. 3.

Fig. 1. Section of the inferior head of the omohyoid muscle. Resection of the internal jugular vein and of the ganglion node.

Fig. 2. Dissection of the recurrent nerve and its ganglion chain. Ligation and section of the inferior thyroid artery. Separation of the artery and the vein.

Fig. 3. Freezing of the trachea. Demarcation of the inferior and middle inferior thyroid veins. The healthy lobe is sectioned. Demarcation of the section. (The operation is followed by the removal of the opposite lobe and immediate grafting of parathyroid body in case of doubt.)

and blood vessels was carried out. Both patients were operated upon in July 1939 and are living well.

Operative technique. The operation is carried out under local anesthesia. A transverse incision runs from the center of the tumor to the anterior portion of the sternomastoid muscle of the opposite side. The longitudinal incision runs from the mastoid process to the clavicle across the center of the tumor. The external jugular vein is doubly ligated and the sternocleidomastoid muscle is completely removed in the course of this dissection. The inferior head of the omohyoid muscle and of the middle cervical aponeurosis is excised. The scalenus anterior and the phrenic nerves are seen as well as the brachial plexus. The internal jugular vein is tied very high under the posterior belly of the digastric muscle. The descending branches of the hypoglossal nerve are cut. The resection of the internal jugular vein is carried out as entirely as far as possible. The superior thyroid artery is next isolated and removed. The bifurcation of the carotids is explored and excess tissue removed. The infrahyoid muscles are removed in their entirety. The laryngotracheal groove is next dissected clean. The thyroid isthmus is divided all on the healthy side of the trachea. There have been no cases in which the tumor invaded the common carotid artery.

This extensive operation is suggested for all malignancies of the thyroid which have extended to any surrounding structure. It is not indicated when extensive metastases or extensions are present especially in recurrence. It should be carried out even when there are no signs of invasion of the ganglia. The contraindications are as follows: extreme cachexia

and wide-spread metastases extending to the trachea and esophagus and tumors which involve the connective tissue, as this type does not respond well to large mass excision. When there are marked extension and adhesions to the trachea or esophagus, operation is contraindicated and roentgenotherapy is indicated.

An extensive operation is proposed (the end results of which are not yet known as the cases have not been carried along far enough to anticipate them) because it is known that the Wertheim massive removal in carcinoma of the cervix gives good results.

RICHARD J. BENNETT, J. M.D.

Miller M. V. Edema of the Larynx. A Study of the Loose Areolar Tissues of the Larynx. *Arch. Otolaryngol.* 94:3 50.

Because information on edema of the larynx was scant and unsatisfactory Miller decided to undertake his own investigation. While experiments on the cadaver cannot exactly reproduce what occurs in the living subject, they can undoubtedly give rather accurate idea of the extent to which edema of the larynx may extend. They seem to indicate that edema may be localized between two adjacent condensations of fibrous tissue. Certain chemical or physiological effect of the fluids may develop in these tissues in disease which might decrease the efficiency of these condensations as barriers to the spread of effluent compared to their efficiency in checking the spread of the fluid in these infections. Certain types of edematous fluids may spread more rapidly than others because of difference in the protein content affect the diffusibility. Various factors such as these make it difficult to

evaluate clearly the clinical importance of these particular findings

Localized edema is known, however, to occur in various parts of the larynx, and many times in areas which might be limited by the barriers here described. So far as the author has been able to determine, no clinician has observed unilateral edema over the esophageal surface of the cricoid. Whether this is because it has been hidden by edema over the arytenoid areas is not known, but it seems likely, as involvement of this area would almost surely be accompanied by edema over the arytenoid area and the aryepiglottic fold of that side.

These experiments indicate also that if the edema involved only the valleculæ and the anterior surface of the epiglottis, there would be little interference with breathing and probably few symptoms other than a sensation of a mass in the throat. It is possible, however, that with the broadening of the surface of the epiglottis and the consequent interference with close approximation of the aryepiglottic folds there might be some difficulty in completely closing the airway when swallowing and fluids might trickle down into the larynx. Such a localization might follow involvement of the lingual tonsil or ulcerations of the epiglottis.

The results also indicate that with infections of the tonsil or the lateral pharyngeal wall, when edema arises it may extend downward into the piriform sinus and from there extend into the aryepiglottic fold. Edema of one aryepiglottic fold might cause some respiratory difficulty but would not cause asphyxia, however, if both should become involved the situation would become acute. It appears that in mild conditions the fold only would be invaded, but it seems sure that if there were much swelling of the structure the fluid would almost certainly have to extend down over the esophageal surface of the cricoid and also invade the deeper tissues on the interior of the larynx. If this involved only one side there would still be breathing space, but if both were involved there would be asphyxia.

The findings seem to emphasize the need for careful watching in any case in which edema has developed or may develop, as the fluid may travel fast and far and when there is swelling of the upper

structures one cannot see how rapidly the obstruction is developing below. One should always be prepared for emergency tracheotomy at the first signs indicating acute asphyxia.

NOAH D. FABRICANT, M.D.

Coutard, H. The Present Conception of the Treatment of Cancer of the Larynx. *Radiology*, 1940, 34: 136.

The five-year results of roentgen therapy of cancer of the larynx reported in 1932 are not greatly superior to those of 1921. The progress was only in some details. Differentiated cancers infiltrating the muscles and intimately united with them, immobilizing the muscles and immobilized by them, generally remained incurable by this method of treatment.

We now have a better knowledge of the chronological involution of cancer of the larynx, and of the chronological steps necessary for its treatment. For a long time we have been influenced by the fact that the undifferentiated forms of this disease disappear with extreme rapidity, whereas the differentiated forms disappear only after three or four months, but the dose which provokes the disappearance of the latter is approximately the same as that which causes the disappearance of the former.

The transportation of the cancericidal dose to the neoplastic cells through the normal tissues, i.e., the distribution in space, has been considered for many years the principal problem in roentgen therapy. Yet this is only the physical part of the problem—the part which should be simplified until we need not consider it any longer. The essential problem is the distribution of time, and physiological repartition.

A simplification of the use of high voltage has been accomplished by the use of a single field with a regular and daily decrease in the surface area and with a regular and daily increase in the dose. The use of this technique increases considerably the precision of treatment and its efficacy, the necessary doses are reduced, and the cancers appear to be more radiosensitive.

In differentiated cancer of the larynx, pharynx, and buccal cavity, the results of the new method seem better than those obtained heretofore.

JOSEPH K. NARAT, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS CRANIAL NERVES

Keller C. J.: *The Regulation of the Blood Circulation of the Brain* (Die Regelung der Blutzirkulation des Gehirns) *Zucker's Year* 1930 67:13

The methodical study of the regulation of the blood circulation of the brain is very difficult. Recently the following have been added as new methods of study: the observation of the width of the vessels through a window in the skull (Forbes); the thermoelectric measurement (Gibbs); the diathermothermal circuit timer (Reis); and the observation of the circulation of the isolated head (Boncharen and Jourdan). The cerebral arteries are by no means end arteries as Cohnheim assumed for numerous arterio-arterial and arteriovenous anastomoses exist. The circulation bed of the thyroid gland is arranged in a parallel fashion to that of the head, and the circulation of the external carotid artery is arranged in parallel manner to that of the brain. Intracranially the same is true of the circulation of the dura mater and that of the choroid plexus. A considerable short circuit exists between the cerebral circulation and the external carotid artery through the ophthalmic and the angularis arteries. It is because of this very fact that the regulation of the cerebral circulation, independently from the general circulation, becomes understandable. The aim of the cerebral circulation is to supply blood and nourishment to the central nervous system and its branches.

The circulation of the brain is comparatively very large—one liter of blood per minute—5 per cent of the total minute volume of the heart. The central nervous system is much more sensitive to anemias and hyperemias than for example, the skin and the musculature. The former is also more protected by means of the bony skull but even this alone would not be sufficient. For over a century the theory of passive cerebral circulation remained firm. Of course, the general blood pressure and the cerebral circulation have something in common with each other but if this were always true then every small circulatory shock would bring about severe or even irreparable disturbances of function in the brain. However this is not the case. If one, for instance, should voluntarily produce a histamine shock, drop in the blood pressure will develop in the aorta and in the circle of Willis, but in spite of this, the congestion of the brain circulation increases tremendously and reaches its maximum just at the height of the drop in blood pressure. When the general blood pressure again increases, the congestion of the brain circulation drops markedly. However this is followed by a secondary increase in the blood volume in the internal carotid artery which is independent of the general as well as the intracerebral blood pressure. This fact speaks unequivocally for the exist-

ence of local autoregulatory mechanism which probably is of neurogenic character.

These results of animal experimentation may be applied also to man. It is by no means correct to put the blood pressure in the foreground. There is no circulation which is passively regulated by pressure alone. Of foremost importance is the automatic heart action. To be sure the circulation of the resting brain follows the spontaneous blood-pressure variations. Nevertheless, the hemodynamics of the cerebral circulation have certain peculiarities. The arterial pulse wave produces a change of space intracerebrally which primarily acts as a compression of the venous system. In general, under normal circumstances, the same amount of blood is brought to the brain as is carried away. It is also a fact that by gradual increase in the intracerebral pressure, as a result of a decrease in the intracranial space, a gradual diminution occurs in the amount of blood brought to the brain; this is at first accompanied by a short temporary increase in the venous outflow. As soon as the increased pressure undergoes change in any manner, be it in relation to time or quantity complicated regulatory mechanisms go into action. The ability of the brain circulation to be influenced by nervous factors is still the object of greatest disagreement. The fact that most of the cerebral vessels possess nerves has been proved, the effects of physical influences, such as increased activity, warmth, cold, and extracerebral pressure are more clearly demonstrated upon the veins of the neck. Certainly it is, however, that the sympathetic system exercises a regulating influence upon the cerebral circulation. With respect to the vagus influence, one can only say that its stimulation results in a vasodilatation and an increase in the blood flow of the brain. Opinions will vary very widely as to whether the nervous influences upon the cerebral circulation are the result of direct or reflex processes.

Of the greatest interest in this respect are the reflexogenic zones of the external and internal carotid arteries. Reis found that after occluding the common carotid artery an increase occurs in the circulatory volume which amounts up to as much as 100 per cent, in the contralateral vessel. M and D Schneider found that this could not possibly be due to a passive process, since this phenomenon did not occur in a decervated organ. They showed further that new branches of the internal carotid artery were tied off the compensatory increase in the circulatory volume of the internal carotid artery failed to develop if the vessel were tied beyond the origin of the middle meningeal artery. This evidently was due to the meningeal reflex which has the function of being a regulatory mechanism preventing threatening cerebral anemia. The influence of the brain circulation through extracerebral vascular and nervous channels is to be sure still very mooted subject.

In this respect there stand, above all, the pressor receptors, which ordinarily exert an extremely forceful influence upon the autoregulation of the circulation. Keller, however, does not doubt the influence of these pressor receptors also upon the cerebral circulation, no matter how minimal this influence may be.

Just as in the coronary circulation, one cannot underestimate the importance of the active reflex regulation of the cerebral circulation by the sinus nerves in the presence of functional pathological conditions. These processes, however, become complicated because of the relationship of the cerebral with the thyroid circulation, the latter, as a rule, behaves in an opposite manner to that of the cerebral circulation, as far as pressure regulatory processes are concerned. This fact is of importance, especially in marked pressure elevations in the regions of the head and neck. For the brain, therefore, a circulatory short circuit which stands under the control of the sinus nerves may be created either by way of the direct internal external (carotid) anastomosis or by way of the thyroid circulation. Unfortunately, however, we know nothing, physiologically speaking, either about the regulatory mechanisms which act only intracerebrally or about the nervous mechanisms which control them.

The nervous influence upon the regulation of the cerebral circulation undoubtedly becomes of secondary importance to the passive phenomena as well as to the heart action. Ordinarily, however, this is the case only when great changes in the circulation take place. In the case of local and pathological conditions, however, it is quite a different matter. The following example will elucidate these statements in the case of ophthalmic hemicrania: the retinal vessels on the side of the lesion are narrowed to a maximum degree. However, if one injects intravenously 0.3 mgm. of gynergen, the retinal vessels become widened and the attack ceases. The influence of chemical substances upon the cerebral circulation is striking. This is true particularly of the nitrites, and, in the order named, caffeine, lobelin, camphor, cardiazol, sympatol, and ephedrine, acetylcholine, the vagus-like substance, also causes a widening of the cerebral vessels in spite of the bradycardia and drop in the blood pressure.

The action of adrenalin upon the cerebral vessels is extremely controversial. However, every brain surgeon knows that the local use of adrenalin causes a vasoconstriction and that the injection of adrenalin into the carotid artery results in an almost complete throttling of the brain circulation. It is only after the adrenalin begins to take effect in the general circulation that this throttling action upon the brain circulation starts to wear off. The most important, however, are the effects of oxygen and carbon dioxide. The circulatory volume of the brain begins to show an increase under concentrations of carbon dioxide which do not lead to a general rise in the blood pressure. Carbon dioxide is the most important substance for the regulation of the blood in the

brain. This substance, however, produces a severe disturbance of the entire circulation, by way of the central nervous system, by causing a contraction of the muscle, splanchnic, and kidney blood vessels (Rein). This process supersedes almost all other nervous regulatory phenomena. Thus the cerebral circulation acts upon the general circulation in so far as the former becomes the bearer and distributor of this reaction.

(FRANZ) HARRY A. SALZMANN, M.D.

Ducuing, J., D'Harcourt, J., Grifo, A., and Folch, A. *General Principles in the Treatment of Fresh Craniocerebral Injuries of Warfare* (Principes généraux du traitement des plaies crâniocéphaliques récentes par projectiles de guerre) *Rev. de chir.*, Par., 1930, 58: 625.

This article, most *à propos* at this time of a new European conflict, attempts to cover in a general and rather telescopic manner all the principles of treatment and after-care of fresh craniocerebral injuries received in battle. It is intended to act as a ready guide to young surgeons and general surgeons whose main experience has not been in the field of trauma to the nervous system. It is written somewhat in the manner of an army medical manual.

The observations by the authors on the cranial injuries seen in the World War and in the recent Spanish war have made them conscious of many errors of treatment. Some of these were the result of inadequate physical equipment for the care of the wounded, lack of knowledge of the nature of intracranial hypertension, too frequent lumbar punctures, too great use of general anesthetics, insufficient respect for the possibility of infection, loss of control of the patient too soon after operation, and many other equally serious factors. The authors go to some length in enumerating the general characteristics of the cranial injuries typical of warfare, such as the presence of multiple cranial openings (such patients usually have other bodily injuries as well), the various possibilities as to the loss of skin, bone, dura, and cerebral tissue, the types of injury to the ventricles and large venous sinuses, and, perhaps most important of all, they bring out the fact that the wounds are always septic.

They are particularly concerned with the treatment of post-traumatic and postoperative cerebral edema, and they believe that except for infection, this is the factor most likely to cause the death of the wounded. They use lumbar puncture cautiously and realize its value, but they depend mainly upon hypertonic solutions administered intravenously to bring about dehydration through physiological means.

The authors point out not only that the surgeon must have adequate instruments and other equipment with which to work, but also that special care in transportation (the wounded should not be transported far to a hospital), early operation, and long-continued postoperative observation by the surgeon are principles which must be faithfully followed. The operation must not be hurried, shaving, cleansing,

and débridement must be done very carefully. Hemorrhage and shock must receive primary consideration, the dura mater must be preserved and kept intact if that is at all possible and the wounds should be closed without drainage. The ensuing cerebral edema will allow no relaxation of nursing care which must be intelligent, and the wound must be considered potentially still infected until the patient has completely recovered. The authors have recently found sulfanilamide of great benefit in the treatment of septic cranio-cerebral injuries. JOHN MARTIN, M.D.

Bull, J. W. D.: The Roentgenological Diagnosis of Chronic Subdural Hematoma. *Proc. Roy. Soc. Med. Lond.* 940, 33, 203.

Any contribution to the correct diagnosis of chronic subdural hematoma, which is frequently a perplexing lesion, is always welcome and this article seems definitely to establish certain criteria which should aid in the roentgenological diagnosis of this lesion.

In a series of 26 cases of subdural hematoma which were studied until recovery occurred and were completely analyzed in the Roentgen Department of the Royal Sæmmer Hospital of Stockholm, Bull found on plain films that () no fracture was seen in any

case () signs of increased intracranial pressure were found in only 3 cases () lifting of the suture lines in a patient of twenty-eight years and thinning of the dorsum sellæ () no gross bone changes or abnormal vascularization of the bones were seen (4) the pineal gland, found calcified in 8 cases, was displaced laterally in but 3 cases (5) a calcified choroidal plexus, seen once, was not displaced (6) calcification of the hematoma was not found (7) the skull shadow on the side of the lesion was in no case denser than on the opposite side. Calcification, if present, would be pathognomonic but it is more usual in the infant than in the adult hematoma.

Pneumo-encephalography usually encephalography by cisternal puncture, was found to be of great aid in the diagnosis of the hematoma. Of the total series, 18 cases were studied by air injections, of which 13 showed a remarkable similarity noted particularly in the anteroposterior position. The salient changes found were () marked shift of the septum pellucidum without much angulation, (2) shift and angulation of the anterior portion of the third ventricle (3) an angulation between the septum pellucidum and the third ventricle (4) contralateral hydrocephalus (5) slight or no dilatation of the lateral ventricle on the side of the hematoma (6) flattening of the roof of the ipsilateral ventricle (7) elevation of the roof on the contralateral side and (8) varying medial displacement of the temporal horn on the affected side. When the films were made in the sitting position, (9) more marked flattening of the roof of the lateral ventricle on the affected side was seen, and () there was greater displacement of the septum pellucidum. These 3 cases, superimposed to form composite figures, are represented in Figures 3, and 4.

Anterography not frequently used nor particularly condoned by the author showed no contrast medium in the hematoma. Two cases of bilateral hematoma occurred in this series.

The author believes that, although no x-ray findings of hematoma are absolutely pathognomonic, the suggestion of such lesion by the x-rays may lead to diagnostic burr holes and thus avoid the more serious and often unnecessary elevation of flap. JOHN MARTIN, M.D.

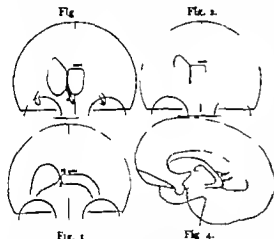


Fig. 1. Mean drawing in supine position. Note: no med. shift of septum. Medial displacement of 6.

Fig. 2. Mean drawing in sitting position. Note: 4 mm. shift of septum.

Fig. 3. Mean drawing in prone position. Note: 1 mm. shift of septum.

Fig. 4. Typical lateral drawing. Note: Falx pressure contralateral ventricle dotted.

KEY TO FIGS. 1, 2, and 3.

- Contralateral ventricle dilated, lateral roof high.
- Homolateral ventricle not dilated, roof flat.
- Septum pellucidum shifted but critical.
- Anterior part of third ventricle upper part shifted laterally forms angle with septum pellucidum.
- Contralateral temporal horn normal position.
- Homolateral temporal horn medial shift.

Pisani, D., and Scalori, G. Rhinopharyngeal Cancer with Propagation into the Cerebral Subarachnoid Spaces (Cancro rinofaringeo con propagazione agli spazi sub-aracnoidei cerebrali). *Settimane med.* 940, 8.

The neurological picture of tumors of the rhinopharynx is usually characterized by the unilateral or bilateral involvement of many cranial nerves, bony changes, the base of the skull which are demonstrable with x-rays, the presence of signs of increased intracranial pressure and the presence of motor or sensory involvement of the extremities. Occasionally however the ray findings may be negative and signs of increased intracranial pressure and motor and sensory involvement of the limbs are present.

The case presented is that of a forty-one-year-old male with diffuse basal cell carcinoma of the rhinopharynx. The onset was characterized by a sense of obstruction in the nose, and soon thereafter of headache and vomiting, which were attributed to increased intracranial pressure. Following this there occurred paralysis of the fifth to the twelfth cranial nerves on the right, and of the sixth to the twelfth on the left. Many cancer cells were found in the spinal fluid. This finding indicated that the tumor had penetrated into the cerebral subarachnoid spaces which is an unusual occurrence, as ordinarily these tumors do not pierce the dura.

DAVID IMPASTATO, M D

Kos, C M. Tumor of the Facial Nerve Within the Mastoid Bone. *Ann Otol, Rhinol & Laryngol*, 1940, 49 151

The second recorded instance of a tumor of the facial nerve within the mastoid bone furnishes the text of this brief article. The tumor was discovered during the course of dissection of 400 mastoid cadaver specimens, and it lay in the facial canal in the angle formed by the posterior wall of the external auditory meatus and the sigmoid sinus, on a level with the facial nerve. Parts of the tumor were fused to the nerve, and parts of it were attached to the adventitia of the sigmoid sinus.

Cytological fixation was poor and microscopic study was correspondingly difficult. Cystic or venous spaces, the walls of which were hyalinized, were quite numerous. Bundles and whorls of long, wavy reticular and collagenous fibers surrounded the long axis of the facial nerve, and the mass appeared to be mainly of connective tissue. Its general classification would seem to be that of neurofibroma.

JOHN MARTIN, M D

SPINAL CORD AND ITS COVERINGS

Saunders, J B deC M, and Inman, V T. The Pathology of the Intervertebral Disc. *Arch Surg*, 1940, 40 389

The intervertebral disc may be involved by degeneration, trauma, infection, and neoplasm. Traumatic rupture of the cartilage plate occurs in conjunction with compression fracture of the vertebral body. An important variety of trauma to the cartilage plate is that associated with marginal fracture of the vertebral body. These chip fractures are usually anterior, and are followed by collapse and thinning of the disc. Rupture of the cartilage plate occurs secondary to loss of support by the spongiosa of the vertebral body. The most common form is that associated with senile osteoporosis of the spine. Similar rupture of the cartilage plate follows loss of bony support due to invasion of the vertebral body by infection or tumor.

Degeneration may occur as early as the third decade, or before, if the integrity of the disc has been interfered with by trauma or congenital defects. The earliest change is an exaggeration in the

size of the nucleus pulposus with an extensive development of cavitation. Later, breakdown in the fibrillary structure and the dissolution of the cellular elements occur until the whole nucleus is reduced to an amorphous mushy mass. In this mass quite rarely calcium salts are deposited. By this time minor defects and erosions of the confining cartilage plates have appeared, which may rupture and lead to the escape of nuclear material. Extruded nuclear material shows a marked tendency to become transformed at its periphery into cartilage, pseudocartilage, or bone.

The annulus fibrosus likewise shows degenerative changes. With the onset of degeneration the inner layers emerge into the expanding nucleus until little more than a ring of the original tissue persists. During this process the lamellae become swollen and areas of necrosis and vascularization appear. The fibrous bundles may separate and produce concentric fissures. These concentric fissures are most frequently anterior and occur most characteristically in kyphosis of old age. The radial fissures are most often found dorsally, and through them nuclear material may herniate into the vertebral canal.

Dorsal protrusions, displacements, or herniations of the disc tissue may cause pressure on the contents of the neural canal. Extradural tumors, variously termed chondromas, fibromas, chondrochondromas, exostoses, and enchondroses, are now clearly recognized as being due to dorsal displacement of disc tissue.

Infections and tumors rarely involve the discs primarily or secondarily. In acute destructive processes such as staphylococcal osteomyelitis, the disc may be completely destroyed. In tuberculosis the disc is nearly always involved secondarily. The disc may be also involved in syphilitic spondylitis, syphilitic osteo-arthritis, and in syringomyelia. Primary tumors of the disc, the chondromas, are rare.

Adolescent kyphosis is a condition of which the cause is obscure. Clinically it is characterized by a rigid rounded kyphosis, centered usually between the seventh and tenth thoracic vertebrae. The kyphosis is rarely discernible before the age of ten, the onset is most frequent between the ages of fifteen and seventeen years. The patients are nearly always healthy with excellent musculature. Pain is an inconstant complaint and is usually in the nature of an ache on exertion. The x-ray pictures are distinctive. The first deviation from the normal is an irregularity of the subchondral bone at the superior and inferior surfaces of the vertebral bodies. These surfaces, instead of appearing as a thin, smooth, continuous distinct line, becomes irregular and broken. The disc is always narrowed. In most cases sizable herniations of the nuclear material into the spongiosa are indicated by sclerosis of the adjacent bones. In older lesions the abnormal transmission of weight from vertebra to vertebra in the region of the kyphosis leads to wedging of the vertebral bodies, sclerosis of the anterior portions of the superior and inferior surfaces of the vertebrae, and osteophyte formation.

Senile kypbosis is due to a special type of destruction of the disc. The characteristic feature is the *spinal curvature*, which appears usually in old life, and develops rapidly as an exaggeration of the physiological thoracic curve. The curvature is most marked in the upper thoracic spine and may progress to a high degree. Post mortem studies on senile kypbosis indicate that the essential pathological process is pressure necrosis of the anterior portion of the intervertebral discs.

Spondylitis deformans is the outcome of degeneration of the intervertebral discs. This degeneration is usually generalized throughout the vertebral column. There is a dissolution with loss of substance in the nucleus pulposus, followed by relaxation and protrusion of the annulus about the periphery. This leads to lateral shifting of the bodies.

Ankylosing spondylitis is considered by more recent investigators as rheumatoid arthritis involving primarily the small articulations of the spinal column. There follows smooth ossification of the anterior longitudinal ligament and of the outer layers of the annulus without formation of osteophytes. The discs disappear to a greater or lesser extent and are replaced by bone. D. VAN J. LAM, ST. LOUIS, MO.

Hampton, A. O. Iodized Oil Myelography: Use in the Diagnosis of Rupture of the Intervertebral Disc Into the Spinal Canal. *Arch. Surg.* 940: 40-44.

With an accuracy of 93 per cent in 33 cases at the Massachusetts General Hospital, Hampton has used iodized oil intrathecally in the diagnosis of ruptured intervertebral disc. The failures, not due to any fault of the myelography, proved to be such lesions as a dilated arachnoidal vein, fractured pedicle of a small vertebra, and cases of thickened ligamentum flavum. Hampton favors the use of oil rather than air in myelography, believing that the technique of the use of the latter and the interpretation of the films is so poorly worked out that an error of 50 per cent may be expected. He recognizes, however, that oil in the subarachnoidal spaces is a foreign body and may act as such to produce disturbing, dangerous effects.

A fairly detailed account of the handling of the patient on the ray table in the examination of the lumbar spine is given. The author warns that care should be taken to select fresh oil, since old or deteriorated oil, dark of color, may cause severe though transient reactions. From 4 to 5 c.c.m. of oil are necessary, smaller amounts being inadequate unless there is frank block of the cerebrospinal fluid due to a ruptured disc, which is not often found. In discussing the technique for lumbar fluoroscopy the author points out that the oil must not be allowed to bead, trying out that suspicious tilting defect must be constant on several films to be of any real significance that a symmetrical, smooth hour glass shadow is rarely due to a ruptured disc, and that since the first sacral nerve crosses the fifth lumbar disc outside of the shadow of the iodized oil, it is

possible for rupture of the fifth lumbar disc to press on the first sacral root and yet not be demonstrated by oil myelography. Several photographs illustrate typical myelographic findings in the presence of ruptured intervertebral discs in the lumbar spine.

JOHN M. STOKES, M.D.

Love, J. G., and Walsh, M. C. Intraspinal Protrusion of the Intervertebral Discs. *Arch. Surg.* 940: 4-13.

The authors say it has been only within the last few years that clinical diagnosis could be made of posterior protrusion of intervertebral disc into the spinal canal, with subsequent compression of the spinal cord or of one or more nerve roots, and yet today it is a diagnosis that can be made in very high percentage of cases by any up-to-date physician.

The authors emphasize the fact that they strongly favor and urge a trial period of so-called conservative treatment, unless there is gross evidence of damage to the central nervous system, before the undertaking of neurosurgical methods for the relief of pain in the neck, shoulders, back, or lower extremities. A period of observation with conservative treatment will indicate to the careful observer in many cases, that there is underlying lesion of the spinal cord or of nerve root which must be attacked centrally.

They are convinced that the intervertebral fibrocartilaginous discs protrude posteriorly into the spinal canal as the result of unusual stress or strain applied to the vertebral column. This stress may be the result of a single outstanding injury or it may be the result of repeated injuries of varying degrees of severity.

In an analysis of 500 consecutive cases in which operation was performed at the Mayo Clinic for protrusion of one or more intervertebral discs, the authors have learned that 58 per cent of the patients gave a history of specific injury to the back. Approximately 96 per cent of the 500 patients seen had lumbar protrusions. This is very important fact, the authors say, for it helps to make a otherwise extremely complicated problem comparatively easy to solve.

The most common symptoms and signs, and those of greatest value in arriving at a clinical diagnosis of protrusion of lumbar disc, are unilateral sciatic pain in 78 per cent of the cases, and bilateral sciatic pain in 6 per cent. In the other 6 per cent, backache alone or extension of pain up the thigh along the course of the sciatic nerve, occurred.

The three neurological signs which continue to be the most helpful in the diagnosis of lumbar disc protrusions are Lasègue's sign, positive in 84 per cent of cases; sciatic tenderness, positive in 84 per cent; and diminution or absence of the Achilles reflex on the side of the pain in 60 per cent.

The most important finding in the analysis of the spinal fluid in such cases is the total protein content of the spinal fluid. In the entire series, 40 per cent of the patients had less than 40 mgm. of total protein

per 100 ccm. of spinal fluid in the specimen submitted for analysis.]

When a diagnosis of protruded intervertebral disc is made and the surgical method of treatment is decided on, the operation should be performed by someone familiar with intraspinal surgery.

The anesthetic agent of choice is ether, administered by the open drop method.

The operative exposure of a protruded disc should be as accurate and as limited as possible; however, adequate room for the removal of all fragments is essential. The articular facets and pedicles should be preserved. No more bone should be removed than is absolutely essential for visualization and removal of the protruded portion of the involved disc. Whenever possible a modified type of laminectomy should be employed, that is, instead of removing 2 or 3 pairs of laminae, the removal of a portion of one pair should suffice in most cases. At times, because of great thickening of the ligamentum flavum and a listing of the patient away from the side of the protrusion, the lesion can be removed without the removal of any bone. It has been possible to remove the protruded disc in more than 20 cases without the removal of any bone from the spinal column. Theoretically, the less bone removed, the stronger the back will be post-operatively, and if at any subsequent time fusion should be required, it can be done with greater ease if none of the spinous processes or laminae has been removed.

The pathological changes observed in cases of so-called hypertrophy of the ligamentum flavum are as follows:

Normally, the affected ligaments are thicker than normal, they measure from 4 to 6 mm. in cross section as against an established normal of from 2 to 5 mm. The cut surface, instead of being homogeneously yellow, reveals in a typical case white bands running throughout. Microscopically, the changes, seen best with special stains for elastic tissue, are as follows: 1. Fragmentation, usually longitudinal, of the elastic tissue fibrils, the ends of these frayed fibrils often appear shriveled. 2. Replacement of damaged fibrils by a more primitive type of mesoderm, namely, fibrous connective tissue. The latter, in many instances, is present in the form of wide bands that run throughout the length of the affected ligament. 3. Blood vessels are few in number and those present are small in caliber as a result of hyaline substance which is deposited within their walls and which replaces the muscularis. This finding leads one, the authors say, to wonder whether vascular damage as a result of trauma may not explain the other changes observed. In 3 "normal" controls studied to date, vascular changes were not noted and the ligaments had none of the alterations noted microscopically.

Macey, H. B. Clinical Aspects of Protruded Intervertebral Disc. *Arch Surg*, 1940, 40: 433.

This is an attempt to present the findings noted on orthopedic examination and, to a lesser extent, on neurological examination in 100 cases in which a

posterior protrusion of an intervertebral disc was of apparent significance in producing the patient's symptoms. It is believed that this syndrome presents sufficient clinical evidence in the history and the examination to arouse suspicion of a posteriorly protruded disc in practically all cases seen, the majority of which can be diagnosed on a clinical history and examination alone. However, roentgenological examination should probably be carried out on all patients to determine the location of the protrusion or protrusions. Also, there is a group of cases encountered in the quiescent period in which a roentgenological examination is necessary for confirmation of a suspected lesion. There is still a third group with the usual clinical findings and history in which the results of the roentgenological examination are negative, and these must be considered for an exploratory examination.

In 23 of 100 cases studied, there was a history of injury severe enough to initiate symptoms unquestionably attributable to the injury. It was of interest to note that in 17 of the 23 cases the injury was sustained with the spinal column in a position of flexion and torsion, in the other 6 the posture was not known. In 9 cases of the group studied, there was a history of many years of backache without known injury to produce the symptoms. In all of these cases the onset of the sciatic pain occurred while the patient was doing some type of work which required standing with the spinal column in a position of flexion, such as shoveling snow and pitching hay, following which the pain was of a persistent nature. In 68 cases of the series, the patients did not associate the condition with any injury of sufficient magnitude to produce onset of the symptoms. From the data obtained it is difficult to draw any definite conclusion other than that the syndrome may produce the following: (1) recurrent backache and recurrent sciatic pain, (2) continuous backache and recurrent sciatic pain, (3) continuous backache and continuous sciatic pain, (4) continuous sciatic pain without backache, or (5) recurrent sciatic pain without backache.

From the pathological anatomy one must conclude that the protrusion results from an injury or injuries, or possibly from disease, although so far as is known by the author the latter has not been reported. The impression one gets in reviewing these cases is that injuries are the basis of all posterior protrusions, but that the degree of the injury or multiple injuries determines the clinical history and the clinical course of the syndrome.

With a severe injury there may be an acute rupture of the posterior annulus and a corresponding bulge of sufficient degree and so placed that continuous symptoms are produced. There may be a spontaneous rupture from an apparently trivial injury in a previously damaged annulus. Also, there is some mechanism whereby the pressure from this posterior protrusion on the nerve root is released, and remissions occur between the attacks. The nature of this mechanism leads to much speculation.

In 50 of the group of 100 cases, there was unilateral limited ability to perform the straight leg raising test; in 4 it was limited bilaterally, and in 26 the patients were considered normal in this respect. The characteristic position of the spinal column in the more acute cases was list to the unaffected side with a scoliosis of the lumbar vertebrae. This was noted in 33 of the 100 cases seen. In only 5 cases was there list to the affected side. In 24 cases the posture was good, while in 21 cases no mention of posture was made and one would assume that it was good.

In 50 cases tenderness was elicited over the lumbosacral joint and was felt to arise from pathological changes in this joint. Possibly in some of these cases the tenderness resulted from lesions of the fourth and fifth lumbar interspace. In 50 cases no tenderness could be elicited on physical examination or it was of such little significance that it was not noted. In 39 cases there was tenderness over the region of the sacro-iliac joint on the affected side, which was probably of little clinical significance. In 80 cases, or 80 per cent, there was very definite limitation of motion, particularly in that of flexion of the spinal column.

In 93 of 95 cases in which fluoroscopic examination with radiopaque oil was employed, there was a positive defect in 4 the procedure was failure, and in 1 the result was negative. In the last disc was found to be the interspace between the fourth and fifth lumbar vertebrae operation. In the remaining cases of the series a direct exploration was carried out without roentgenological examination. Forty-one of the posterior protrusions occurred at the fourth and fifth lumbar interspace, 46 at the lumbosacral joint, 8 at the third and fourth lumbar interspace, 1 at the second and third lumbar interspace, and 4 patients showed multiple protrusions. In this group there were 23 midline and bilateral protrusions of the discs. The remaining 7 cases presented unilateral protrusions.

It is the author's impression after completing this study that a possible explanation of the intermittency of the symptoms is that in some manner change in position of the dislodged nucleus beneath the annulus fibrosus results in a reduction to some

what of normal anatomical position. From the cases observed at the time of operation, one would anticipate that this could occur by reduction of protruded nucleus pulposus between the intervertebral bodies, which would permit collapse of the annulus and release of the nerve compression. The author also mentions a test which is believed to be of significance in the examination of patients with posterior protrusion, that of sudden unexpected hyperextension of the lower lumbar vertebrae. When positive, pain is reproduced over the course of the affected sciatic nerve. The mechanism whereby this occurs is probably a narrowing of the posterior interspace with sudden relative increase in the posterior bulge and sudden pressure on the nerve root.

The treatment of this lesion is confined to the neurosurgical division of the Clinic and consists of laminectomy and removal of the ligamentum flavum and disc, in which procedure the articular facets are preserved. There are many cases which require the consideration and measures of the orthopedist in association with the neurosurgical procedure, and it is essential to have close harmony between the orthopedist and the neurosurgeon in the handling of these cases. The cases in which combined procedure is employed, that of hemi-laminectomy and removal of the disc and bone graft, include such conditions as spondylolisthesis, separated neural arch without slipping of the vertebral body and marked narrowing of the intervertebral space with hypertrophic arthritic changes.

Stackay, R.: Compression of the Spinal Cord and Nerve Roots by Herniation of the Nucleus Pulposus in the Cervical Region. *Arch. Surg.* 92, 40, 47.

While true chondromas of the cervical spine do occur they are much less common lesions than ruptured intervertebral discs, and it is probable that many lesions formerly called chondromas are actually protrusions of the nucleus pulposus through the annulus fibrosus.

Such cervical protrusions are primarily degenerative lesions, developing slowly and are not the result of one sudden, severe trauma. Since protrusions of the cervical spine affect primarily the cord and not the roots, the symptoms would be those of a sudden onset if the lesion were due to sudden trauma and would give unmistakable sudden clinical signs of cord injury, all of which is not true in the usual history of the slow progression of symptoms in protruded disc.

The symptoms of herniation of a cervical intervertebral disc are due to the direct pressure of the mass on the cord and the roots, and symptoms will vary with the exact position and bulk of the mass. There may be present the syndrome of bilateral pressure depending upon the size and position of the herniation. (1) If the mass is small and medially placed on the ventral surface of the vertebral canal, pressure is exerted bilaterally on the ventral horns and roots and gives rise to bilateral signs referable only to the ventral gray columns, but (2) if the medially placed mass is large, the signs are indistinguishable from those of ventral cord tumor. The second syndrome, that of unilateral ventral pressure due to pressure of an off-center mass upon the ventral horn and ventrolateral columns of one side, consists of focal atrophy and crossed dissociated sensory changes. The third syndrome, that of unilateral and pressure is characterized by a unilateral focal muscular atrophy and focal pain, without of course, any symptoms of pressure on the long fiber tracts.

Vertebral tenderness is seldom of any localizing value. Manometric tests and total protein studies upon the cerebrospinal fluid may add but little in-

formation, since at best no more than a partial block is usually caused by a protruded disc. Air and oil myelography are inconclusive, inadequate, or actually dangerous. X-ray evidence of a narrowed intervertebral disc may be present even in the absence of a herniation, but with any evidence which such tests furnish, together with the localizing clinical signs, a laminectomy is always indicated because it offers the only means of help to these patients. A hemilaminectomy with sufficient bone removal laterally is advised. The dura is opened, if necessary, to avoid undue rotation of the cord, but it is well to perform the enucleation extradurally if it can be accomplished with any degree of ease and accuracy.

JOHN MARTIN, M D

Spurling, R G, and Grantham, E G. Neurological Picture of Herniations of the Nucleus Pulposus in the Lower Part of the Lumbar Region. *Arch Surg*, 1940, 40 375

This communication is based on 125 consecutive laminectomies performed for intractable pain low in the back, and sciatic pain. There were 92 cases of frank rupture of the annulus fibrosus with herniation of the nucleus pulposus. The lesion occurred at the fifth lumbar interspace in 51 patients, at the fourth in 39 patients, at the third in 1 patient, and at both the fourth and fifth in 1. In this series the incidence of ruptured intervertebral disc at the fourth and fifth lumbar interspaces was 99 per cent. The diagnosis could be made on the basis of the history and clinical findings alone, without the use of contrast myelography in about 50 per cent of the cases.

The initial symptom of disease of an intervertebral disc is, almost without exception, pain low in the back (lumbago). The onset of the pain is sudden and usually follows trauma, lifting in a bent forward position, or sudden torsion of the trunk. Shortly after, sciatic pain may occur. Occasionally sciatic pain occurs after a number of attacks of "lumbago." As the pain in the leg increases in intensity, the pain in the back usually diminishes or disappears entirely. During the acute stages the pain, both in the back and in the leg, is intensified by coughing, straining, or sneezing. Paresthesias in the involved dermatotomes commonly accompany the pain in the legs. The paresthesias are not constant, and usually are brought out by certain postures, or by coughing, straining, or sneezing. Observant patients frequently describe a sensory loss which is limited to the involved dermatotomes. Weakness is not a common feature. In some instances, however, weakness limited to one group of muscles is present.

The clinical localizing signs are tabulated by the authors as follows:

Third lumbar interspace

- 1 Disability of the lower part of the back, with local tenderness at the third lumbar spine and reduction of the lumbar lordosis
- 2 Positive Lasègue sign
- 3 Positive Naffziger test (pressure is applied over both jugulars until there is a sense of fullness in the

head or until the patient's face is flushed, and when the test is positive there is pain or paresthesia in the back of the leg.) This is considered by the authors as pathognomonic of intraspinal disease.

- 4 Reduction or absence of the knee jerk, the ankle jerk is unchanged

- 5 Hypesthesia and paresthesias in the fourth and fifth lumbar dermatotomes

Fourth lumbar interspace

- 1 Disability of the lower part of the back with stiffness of the lumbar portion of the spine and localized tenderness at the level of the fourth lamina, with reduction of the lumbar lordosis

- 2 Positive Lasègue sign

- 3 Positive Naffziger test, with paresthesias involving the fifth lumbar, the first sacral, and perhaps the second sacral dermatotomes

- 4 Ankle and knee jerks uninvolved

- 5 Hypesthesia and paresthesias in the fifth lumbar and first sacral dermatotomes

Fifth lumbar interspace

- 1 Disability of the lower part of the back with absence of lumbar lordosis and localized tenderness to pressure over the fifth lumbar vertebra

- 2 Positive Lasègue sign

- 3 Positive Naffziger test producing paresthesias radiating into the first and second sacral dermatotomes

- 4 Diminution or absence of the ankle jerk

- 5 Hypesthesia involving the first and second sacral dermatotomes

DAVID J. LIPASTATO, M D

PERIPHERAL NERVES

Dumas, R. Injuries of the Nerves. Late Results of Surgical Treatment and Indications for Operation (*Blessures des nerfs résultats éloignés du traitement chirurgical et indications opératoires*). *Presse méd*, Par, 1940, 48 99

Dumas leaves one with the impression that he is still pessimistic over the results, by and large, of peripheral nerve surgery, to him, at least, the results of such surgery so far have fallen short of the desired and expected goal. His article is a brief but instructive review of pertinent opinions (principally French) since 1883, and he has contrasted the views of a long list of surgeons on the relative merits of early and late suture, on grafts, such as alcohol-fixed grafts, rabbit cords, heterografts of fresh nerves, and fresh autografts, and on indications for operation.

He brings up the matter of the wide divergence of results of peripheral nerve suture in several large series of cases seen during the World War, and he is, like many another surgeon, puzzled by the lack of uniformity in results obtained by the same manner of treatment. He emphasizes the fact that "we should all talk the same language" in evaluating the results of peripheral-nerve repair. The restoration of a nerve is always null, partial, or total, there is no in-between or variation of these conditions.

Several general principles have become reliable guides in peripheral-nerve surgery.

In recent injuries, repair of the nerve should be done as soon as possible. After a neurological examination has been made and recorded, and the nerve should be treated in the proper manner with skill.

In old injuries, careful neurolysis of prime importance; the nerve end must be fresh and show normal tissue when they are approximated end to end; no tension must be allowed on the suture line; no secondary repair can ever be done in the presence of the least infection; the newly sutured nerve should be placed in a fresh, scarless bed of muscle or fat, and only fresh endografts are to be used when graft is found to be necessary. In incomplete lesions, as in the case of lateral neuromas and local indurations without neuromas, one should determine the amount of remaining function as accurately as possible, and by observation over a period of time judge whether or not surgery will offer more than hopeful patience.

JOHN M. LARRY, M.D.

Posznan, A. A New Technical Modification in the Method of Laterolateral Anastomosis of the Peripheral Nerve (See also a new modification of technique of the method of anastomosis latero-lateral del nervi periferici) *Arch. Ital. di chir.* 9:39-57, 1933.

The superiority of laterolateral anastomosis of the peripheral nerves over the other methods is probably due to the greater limitation of the damage inflicted on the healthy nerve and to the resulting aligther connective tissue reaction to the anastomotic level, besides the healthy fibers which may have persisted in the damaged nerve are not interrupted and the remaining partial function of the nerve will not be jeopardized in case of operative failure. The experiments of Posznan showed that in successful laterolateral anastomosis of the completely paralyzed peroneal nerve with the tibial nerve, it is sufficient to remove to the point of contact between the two nerves the perineurium of the peroneal and one-fifth of the fibers of the tibial for a distance of 5 cm. Uniform anatomical relations are not necessary as far as variable as in the case of these two nerves and some effective means has to be found to bridge the space separating the donor from the receiving nerve. Therefore the author decided to use toplastic and heteroplastic transplants of peripheral-nerve tissue, which he anastomosed laterolaterally to the tibial nerve.

For his experiments, he selected puppies aged not more than two months, because the younger the animal the more rapid and complete is the regeneration of the nerve. Under ether anesthesia, the dogs

were prepared for the anastomosis by section of the peroneal nerve close to its origin from the sciatic nerve and by suturing of the stumps separately to the cutaneous cellular tissue at sufficient distance one from the other to prevent any possibility of even indirect connection between them. Then a portion 1 cm. long and involving the perineurium and one-fifth of the fibers was cut out of the lateral aspect of the tibial nerve close to its origin from the

sciatic nerve while an equal portion of the peroneal nerve was removed from the distal part of the peroneal nerve about 4 cm. from its original section. A 5 cm. piece of nerve taken from one of the branches of the brachial plexus of the same animal and, in 3 cases, piece of calf nerve fixed in alcohol and then kept for some time in sterile physiological salt solution were used as transplants to be anastomosed laterolaterally to the excised parts of the tibial and peroneal nerves by means of fine silk sutures.

Functional and anatomical studies of the toplastic transplants made at various intervals after the operation showed that histological evidence of beginning regeneration was present in the anastomotic bridge and in the peroneal nerve after four months, but that no response of the nerve to galvanic stimulation could yet be demonstrated. After 12 months, the motility of the muscles innervated by the peroneal nerve as being re-established and the nerve responded to electric stimulation. Histologically the regeneration of the nerve fibers is more advanced. After ten months, the functional tests of the leg gave practically the same results as those of the other leg. Histologically the regeneration of the nerve is advanced far enough to allow the conclusion that the trophism of the muscles could be completely re-established. In fact, the muscles already appeared normal macroscopically and microscopically at that time.

On the other hand, the functional tests and the histological examinations of the heteroplastic transplants did not reveal the slightest sign of regeneration even after ten months.

In the practical application of this method, it is naturally difficult to obtain the necessary autoplasmic material, but the complete lack of result with heteroplastic transplants suggests that the results might be quite different if homoplastic material were used. This question will be the object of further studies.

RICHARD KRAMER, M.D.

MISCELLANEOUS

Alberti, A. Perineal Dystonia of Causalgic Type Due to Stripping of the Pudendal Nerve by Aneurysm of the Homonymous Artery Treated and Cured by Resection of the Vasculoneurotic Bundle (*Distonia perineale tipo causalgica, per distruzione del n. pudendo da aneurisma dell'arteria omologa, curata guarita con trattamento radicale resezione del fascio vascolo nervoso*) *Chir. chir.* 940, 4-99.

Alberti reports the case of a woman, aged thirty-nine years, who after her first pregnancy about eighteen years previously, developed some hemoroid nodules accompanied by attacks of pain which had become worse lately. She was very constipated. The attacks, which were rare in the beginning, consisted now of painful spasms occurring several times during the day and night and involving the sternal part of the perineum with irradiations around the vagina, the urethra, and especially the clitoris, where the pain assumed the form of caustic burning. At

times, inflammatory symptoms appeared in the hemorrhoids. Examination revealed the presence of hemorrhoids around the anterior border of the anus and marked anal and vaginal spasm. When the patient was lying on her right side, she felt pulsations inside the pelvis. Digital pressure on the right ischiatric process caused tenderness which spread upward deeply into the pelvis. During general perspiration the perineum was especially involved and was dripping with sweat. The pilocarpine test caused moderate general perspiration with great increase of the perineal perspiration. Surgical intervention was decided upon to remove the hemorrhoids as high as possible because a nodule had been found to extend rather high along the anterior wall of the anorectal canal. However at operation an aneurysm of the internal pudendal artery, 2 cm long, was found about 1.5 cm above the medial border of the ischiatric tuberosity, the deformed artery, the nerve, and some veins formed the pudendal bundle. The pudendal nerve divided behind the aneurysm and its two branches were astride the aneurysmal sac. The various elements of the pudendal bundle presented strong adhesions between themselves and with the aneurysmal sac and the obturator membrane, so that mass excision was found advisable. The results of the operation were excellent, as shown by a follow up examination eight months later.

This is the first case of aneurysm of the pudendal artery found during life and reported in the literature. However, its significance exceeds its anatomical interest because it was the principal factor in the

origination of the perineal dystonia which was thought to be caused by the hemorrhoids. The diagnosis was cleared up only by the operative findings. There is no doubt that at least a probability diagnosis could have been made by thorough rectal exploration all the more so as sensitivity of the ischiatric tuberosity was demonstrated, which is one of the symptoms of homolateral pudendal nerve involvement. On the other hand the intense localized perspiration of the perineum, which might be interpreted as being connected with general lability of the neurovegetative system, must have been favored by the peculiar structure and innervation of this region. The pudendal nerve contains not only cerebrospinal fibers but also fibers of a sympathetic nature and function and the pudendal plexus emits parasympathetic filaments and is connected with the pelvic sympathetic system, under the circumstances, endogenous and exogenous stimulation may give rise to the most variable picture of neurovegetative reaction. The cutaneous expression of the sympathetic involvement through the pudendal nerve acquires decisive significance from the fact that it has not reappeared after excision of the nerve. The inflammatory remnants found under the form of connective tissue adhesions between the elements of the pudendal bundle and the obturator membrane, and the peculiar position of the pudendal nerve, tightly adherent to the aneurysmal sac explain the reactive condition of the nerve, the various clinical manifestations depend on the complex composition of the nerve.

RICHARD KIMM, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Heiberg, B., and Heiberg, P. Some Investigations Into the Occurrence of Carcinoma of the Breast, with Special Reference to the Ovarian Function. *Acta chirurg. Scand.* 940, 83 479

In this intensive review of the literature on the subject, with pertinent observations on the various clinical and experimental works, Heiberg and Heiberg point out that there is a definite relationship between ovarian function and the development of carcinoma of the breast. They further point out that the actual connection is still unknown.

In an endeavor to throw further light on the existing connection the authors undertook a detailed statistical study of 100 cases of mammary carcinoma in Copenhagen, as well as an analysis of statistics from Denmark as a whole. In general, the mortality rate from carcinoma in Denmark is definitely greater in unmarried women than in married women. An analysis of statistics showed that mortality from mammary carcinoma increases with age and, therefore, there is no climax near the beginning of the menopause. It was thought that possibly unmarried women tended to seek medical care at a later date than did married women, which influenced the mortality rates. However this did not prove to be the case. In order to eliminate possible errors in the census, deaths due to crupulous pneumonia and carcinoma of the gastro-intestinal tract in unmarried women and married women were compared. No appreciable differences were found.

The authors found that in nearly two-thirds of their group of cases the menopause had not occurred at the age of fifty. This figure is very high, for on the average in Denmark only 50 per cent of the women menstruate at the age of fifty or more. Considerable significance is attached to this fact.

No connection between previous gynecological or endocrine diseases and the development of carcinoma of the breast could be demonstrated.

The authors urge that further detailed histological investigations to distinguish between various groups of carcinoma of the breast be made. They suggest that the preponderance of the disease in unmarried women might be due to the more frequent development of one particular type of carcinoma, which in turn may be connected with a difference in ovarian function.

LILLY H. WOLFE, M.D.

TRACHEA, LUNGS, AND PLEURA

Reisner D. and Tcherikoff, I. G. Cystic Bronchiectasis. *Am. J. Roentgenol.* 940, 43 337

The authors report a group of 7 cases of cystic bronchiectasis, or polycystic lung, which they consider distinct clinical entity different from chronic bronchiectasis.

The ages of the patient varied from eleven to seventy years—were males and 5 females. As a rule the respiratory symptoms were mild, consisting of chronic cough, with scanty sputum and frequent colds. Constitutional symptoms were absent unless complicated by other lesions. Physical examination revealed slight changes from the normal. The most frequent physical signs are the presence of numerous moist *mediana* and *crackles*. Roentgenograms showed a honeycombed appearance of the lung fields produced by a cluster of thin walled, closely packed cavities separated by fine trabeculations, which frequently presented fluid levels. There was an absence of infiltrative lesions or fibrosis in the uncomplicated cases.

The authors believe that this condition is of congenital origin and is due to the arrest of development of the terminal bronchioles and the lung parenchyma.

The condition is of importance and should be differentiated from sacular bronchiectasis and tuberculosis. Unless the patients develop complications they usually go through life only mildly handicapped.

JULIAN A. MOORE, M.D.

HEART AND PERICARDIUM

Holman, E. Hemodynamic Hypertrophy Due to Increased Peripheral Resistance. *J. Thorac. Surg.* 940, 9 363

Cardiac enlargement may be due to hypertrophy, dilatation or a combination of both. The factors responsible for the enlargement are not always obvious.

This author has studied the problem with a view to determining accurately the exact role of peripheral resistance in cardiac hypertrophy uncomplicated by distention of the cardiac chambers by means of experiments on newborn or on very young puppies. The heart of the young animal was exposed through a small incision, the pericardium was opened, and a silk ligature was placed around the root of either the pulmonary artery or the aorta and tied so as to encircle the vessel snugly, but not to constrict it even slightly. As the animal and its organs grew in size the vessel remained constricted to its original size at the site of the ligature and relative stenosis occurred. A litter mate was kept as the control animal.

In this type cardiac hypertrophy, limited to one half of the heart, was produced by increasing peripheral resistance alone. It was not accompanied nor preceded by dilatation. This hypertrophy occurred on either side of the heart, depending upon the site of the constriction. It cannot therefore in the case of pulmonary stenosis be dependent upon an increased coronary flow such as might be invoked as a cause of the left ventricular response to constriction beyond the coronary arteries. This hypertrophy

was sufficient to produce conspicuous cardiac enlargement, an enlargement which was quite different from that which followed the establishment of an arteriovenous fistula. The study showed further that cardiac enlargement may be due to two very different factors, in pulmonic and aortic stenosis, the enlargement is due to hypertrophy, limited to one half of the heart. This hypertrophy is due to the increased peripheral resistance against which the cardiac musculature must work. In the presence of the peripheral fistula, the enlargement is almost entirely due to dilatation with thinning of both ventricular walls. In this instance there is a decrease in peripheral resistance but an increase in the volume or bulk of blood flowing through the heart.

Cardiac enlargement observed clinically or roentgenographically, therefore, may be due either to dilatation or to hypertrophy.

J. DANIEL WILLEMS, M.D.

ESOPHAGUS AND MEDIASTINUM

Guimarães, S. A Contribution on the Surgery of Mega-Esophagus. Considerations on 140 Cases (Contribuição á cirurgia do megaesôfago consid. crônicas em torno de 140 casos). *Cultura méd.*, 1939, 1: 377.

Guimarães states that at present most authors accept the methods of dilatation as the only ones which offer probabilities of success and security in the treatment of mega esophagus. Many appliances, made of metal or rubber, have been described for this purpose. The author uses an instrument constructed according to his instructions, it has a dilator made of a tube of fine tissue which is placed between two tubes made of rubber fixed proximally to the rubber shaft of the instrument and distally to the protruding steel wire which runs inside of the instrument, and has a removable olivary extremity. The rubber shaft bears the usual marks corresponding to the classical distances of the diaphragm, cardia, and stomach from the dental arches.

The indications and contraindications for the use of dilating instruments must be given exclusively by esophagoscopy. Previous operation or dilatation with sounds does not constitute a contraindication, but caution is recommended in employing the dilating tube, which should not have a diameter of more than 3.5 cm. Only 2 of all the patients attended by the author were excluded from immediate treatment, because of intense esophagitis. Some of his patients presented fibrous cardias which could not have been passed by the instrument without the help of the olivary wire. Although each case had to be considered individually, a routine method was established which took the following points into consideration: use of the dilating tube distended by air pressure, abstention from manometric control, abstention from roentgen control, introduction of the instrument without wire guide, and dilatation varying between 2 and 4 cm. These rules could be applied in the majority of the cases, in only 1 patient was it

necessary to use esophagoscopy to introduce the olivary wire through the cardia and to place the dilator.

Before dilating, it is advisable to make the patient regurgitate the contents of the esophageal sac. The patient is seated with the head slightly bent forward, and no anesthesia is used. The instrument passes into the esophagus when the patient makes a swallowing movement or stops breathing, the head is raised, and the instrument penetrates down to the diaphragmatic narrowing, if it does not pass the sphincter immediately, some slight back and forth movements help to overcome the resistance and a peculiar feeling announces the passage of the instrument into the stomach, into which it is introduced several additional centimeters. The instrument is fixed at the dental arch by an assistant and the tube is distended with air by means of a 100 c cm syringe. It is impossible to overdistend the tube because of the presence of the tube made of tissue which limits dilatation. The dilatation usually lasts about five minutes. On the day of the intervention, the patient is kept in bed and given a liquid diet, on the following day, he is allowed to get up, and takes a liquid and soft diet, after that, the diet is unrestricted. The results have been excellent. 140 patients have been treated. Two patients have died from mediastinitis caused by rupture of the esophagus; these accidents occurred among the first patients treated, because of excessive dilatation with tubes having a diameter of 4.5 and 5.5 cm, since then, none of more than 4 cm have been used. No patient has been dilated more than 6 times. In 26 cases there were recurrences necessitating another series of treatments; in 11, the recurrence appeared during the first six days after the end of the treatment, and in 15 between eight days and seven months after the treatment.

RICHARD KEMEL, M.D.

Noehren, A. H. Artificial Skin-Lined Antethoracic Esophagus for Impermeable Stricture. *Surgery*, 1940, 7: 364.

The making of an extrathoracic esophagus has a very limited field, namely, (a) in cases of benign stricture that are absolutely impermeable by all known methods, and (h) in cases of malignant stricture in which the cancer has been successfully removed.

When indicated, the making of an esophagostomy, and the introduction of a skin tube down the front of the chest is the simplest and safest method. The only disadvantage is the difficulty or impossibility of making a connection between the lower end and the gastric fistula, but this gap can be easily bridged by a shorter rubber tube.

The author reports the case of a young twenty-four years of age in whom an artificial extrathoracic esophagus was constructed for a benign stricture secondary to a burn by a caustic fluid. The procedure was carried out in several stages. The operation is described in detail and is well illustrated.

SAMUEL H. KLETY, M.D.

Bernou A., Fruchaud H. and Marecques, L.: Thoracoplasty and Excessive Mobility of the Mediastinum (*Thoracoplasties et Sottentend médastinal*). *Arch. méd.-chir. de l'Épée* 1909, 4, 34.

Bernou and his associates note that excessive mobility or floating of the mediastinum is a serious complication of thoracoplasty. With improvement in the technique of thoracoplasty it occurs less frequently, especially if an extensive one-stage operation is adopted. Since 1934, the thorax has adopted the practice of resecting the lower ribs in the first stage of thoracoplasty and never resecting the first rib until the second stage. Excessive mobility of the mediastinum was noted in a few cases even with this method, although no deaths resulted. Thus, the authors made a special study of the mobility of the mediastinum prior to operation. For this purpose, fluoroscopic examination was made with the patient in lateral decubitus, lying first on the left side with vertical screen at the back, then on the right side with the screen in the same position; the rays were centered perpendicularly to the screen. The distances of the "point of the heart" to the axillary line were recorded in each position; the difference between the two measurements at times was only from 1 to 3 cm., which indicated no excessive mobility of the mediastinum; if the difference was over 3 cm., the mediastinum was excessively mobile. Even differences of from 1 to 3 cm. should be considered in deciding on the technique of operation.

If the fluoroscopic examination by this technique shows a displacement of from 4 to 6 cm. the antero-lateral subpectoral route is never employed for the thoracoplasty; the paravertebral or subscapular route is the method of choice. In such cases the extent of the rib resection on the second, third, fourth, and fifth ribs in the first stage of the thoracoplasty is limited. The second stage is delayed at least three and sometimes four weeks; in this second stage the first rib may be entirely resected and the resection of the other ribs may be extended. A small portion of the sixth rib may be resected, but this should not be done if the displacement of the mediastinum is found to be from 5 to 6 cm. In the pre-operative examination, resection of the ribs by the subscapular route, the transverse processes of the vertebrae are left intact. With this technique no complication from excessive mobility of the mediastinum has been observed, and the operation causes much less shock to the patient. ALICE M. MYERS.

MISCELLANEOUS

Ransom, F. T. Notes on Gunshot Wounds of the Chest. *J. Thoracic Surg.* 1940, 9, 278.

The author writes about his experiences in China, and his article is probably one of the first accounts, if not the first, of gunshot wounds in the chest in the present war in China.

It begins by reviewing the history of gunshot wounds in the fifteenth century. He then gives the

figures for some past wars, dealing with the number of chest wounds and the number of deaths among the wounded with chest wounds. He states that about one out of every 12 is of the chest. The number of men who die on the field of chest wounds is from one-third to one-half of the total number who are killed, but the more important figures are those which deal with the deaths among the wounded who are taken off the field to the hospitals. These figures are very enlightening. They show that the English in the Crimean War lost 70 per cent of all men who were wounded in the chest and who arrived at the hospital for treatment. The figures then show a definite progress and trend through the American Civil War, the Franco-Prussian War, the Spanish-American War, the Boer War, the World War, and the Sino-Japanese War of 1937. In the last war the number who died from chest wounds after being treated in the hospital amounted to 4.8 per cent. These figures definitely show the tremendous strides which have been made in the treatment of chest wounds.

The author then relates his own studies of 30 cases of chest wounds during the hostilities which took place in the vicinity of Shanghai, China, in 1937.

Pneumothorax is a most important consideration in the treatment of chest wounds. Mediastinal flutter is of great significance because of its effect upon the great veins which carry blood to the heart. The systolic output is dependent upon the diastolic inflow, and the mediastinal flutter causes periodic obstruction to both the superior and inferior vena cava. The symptoms of open pneumothorax are due therefore to circulatory disturbances rather than to the respiratory disturbance per se.

Other important points are the rapid loss of heat from the chest and the great tendency toward infection. The use of the opening in the chest, all of which is compatible with life is of importance also, and bears direct relationship to the vital capacity of the patient. Tension pneumothorax produces even more marked symptoms of distress than the open variety because this pressure in the pleural cavity of both sides approaches positive value. When this condition is present on the right side, all effects are produced more rapidly than when it is on the left side for the right heart and great veins are more sensitive to pressure than the left heart and the main arterial trunks. A tension pneumothorax, unless relieved, invariably leads to a fatal outcome.

Blood in the pleural cavity will cause collapse of the lung to a degree dependent upon the amount of fluid involved. There is a tendency toward spontaneous arrest of bleeding from the lung when a balance is obtained between the collapse of the lung and the pressure in the pleural cavity. Removal of large quantities of blood from the chest cavity is frequently found to cause unpleasant and dangerous cardiac-respiratory symptoms which can be counteracted by replacement.

Cardiac tamponade when more than 100 ccm. exerts definite pressure upon the heart. The thicker-walled ventricles are not diversely affected but the

aericles and the great veins are found to be definitely affected

Practically all of the cases of the author consisted of wounds of the penetrating variety. Some of these varied from small, almost immediately sealed bullet holes, to large and gaping openings in the chest wall. Thoraco abdominal wounds were very few, and most of these led to death before the patient reached the hospital. Wounds of the through and through variety were very numerous and the exit wound was sometimes larger than the entrance wound, sometimes the same size, and sometimes even smaller. A certain number of soldiers had retained projectiles in the chest. In some, the projectile had stopped in the spine or had gone into the abdomen.

Shock and collapse were present in a marked degree in nearly all cases. Pneumothorax was also present in nearly all cases. In 2 cases tension pneumothorax was observed. Hemothorax was almost invariably present. Pyothorax was a common sequel, and frequently all three, pneumothorax, hemothorax, and pyothorax, were combined. Euphysia of varying degree was also seen. One man had emphysema which resulted in the closure of both his eyes, and his scrotum became the size of a football. He was described as having the appearance of a gigantic frog. Brachial plexus injuries were found in 1 soldier, and in axillary aneurysm was found in 1. Among the remote complications were septicemia, pneumonia, and cerebral abscess, such complications as dysentery, malnutrition, and beriberi were also the cause of several deaths.

The examination of patients was necessarily always done during rush periods. When first admitted, examination was often perfunctory. A notation was made of the site and size of the entrance wound, the site and size of the exit wound, and whether or not the wound was of the "sucking" variety. If the last was found instructions were issued that the wound must be covered it once by a large wet dressing. Great stress was placed on the degree of shock present and the amount of external hemorrhage. The position of the apex beat, the position of the trachea, and the presence of dullness were likewise recorded. Effusions, if present were examined by the naked eye or the microscope and sometimes cultures were made. Fluoroscopies and x-ray pictures were used extensively.

All patients were examined once a week by means of the fluoroscope. In the cases of emphysema a chart was kept showing the size of the cavity from day to day. All patients with cavities were likewise examined with the thoroscope but nothing striking was discovered.

Treatment consisted first of attending the shock and bleeding. This was done by the administration of morphine and the application of heat. Blood transfusions could not be given because there were no typed donors available. Intravenous saline solution was used instead. A good many patients with through and through bullet wounds made a rapid recovery after a simple antiseptic dressing and the

administration of morphine and rest. After the patient recovered from the initial shock, the usual practice was to excise the wound, remove portions of the fractured ribs, arrest the hemorrhage in the parietal wound, remove foreign bodies if easily accessible, and, if possible, close the wound by suture. No extensive search for foreign bodies was carried out and no attempt was made to arrest hemorrhage from the lung itself. The first principle of treatment was to close the wound in the chest wall, the hemothorax was treated later.

Anesthesia for most of these operations was local, but sometimes this was supplemented with ether or evipan.

Open pneumothorax was treated with saline infusion for the shock, and an early production of a closed pneumothorax by suture or by packing. Tension pneumothorax was treated simply by letting out the air. Hemothorax was dealt with by controlling the hemorrhage from the chest wall and by closing the wound. It was believed that if the wound involved a large vessel at the root of the lung, death was certain to occur anyway, but if the wound involved only peripheral vessels these would be controlled by the pressure of the hemothorax and the pneumothorax. Aspiration was not done for several days unless signs of pressure or infection appeared early, but after a few days the blood was aspirated and replaced with air. However, never more than 1000 cc. were aspirated at a time. Pyothorax was a very common complication and usually followed hemopneumothorax. The treatment of these cases consisted, as far as possible, of drainage with avoidance of an open pneumothorax during the early stages of the empyema. Early sterilization with obliteration of the cavity was attempted and the nutrition of the patient was carefully maintained. Of 35 patients with empyema, all but 3 healed in a period of four months.

Retained projectiles in the chest did not as a rule give rise to troublesome symptoms. In a few cases, presenting such symptoms, these bullets or shell fragments were removed.

The total number of admissions to the hospital in this period of the war consisted of 1,186. Of these, 115 were patients with chest wounds, and 17 of these died from these wounds. Therefore 10 per cent of all the wounded had chest wounds, and 14 per cent of these who reached the hospital died.

J. DAVID WHITE, M.D.

Marcotte R. J., Phillips F. J., Adams, W. E., and Livingstone, H. Differential Intra-bronchial Pressures and Mediastinal Emphysema. *J. Thoracic Surg.*, 1940, 9, 346.

Lutuer of Paris in 1866 placed a metal tube through the larynx and anesthetized a patient in this manner, following which a partial lung resection was performed. This is the first case in which an intra-tracheal insufflation was done. The authors give a rather complete historical background for the method. A series of clinical cases along with a few com-

plications, and also some experimental evidence of complications are given with the following conclusions:

Intratracheal positive-pressure anesthesia may result in serious or fatal complications. Increased intrabronchial pressure either by intratracheal or mask-anesthesia technique may produce deleterious effects by overdistention and laceration of the intrapulmonary tissue with subsequent development of mediastinal emphysema and pneumothorax. Intrabronchial pressure depends chiefly upon the patency of the outlet, rather than upon the pressure at which the gases are forced into the lungs. Intrabronchial pressure of 8 mm. of mercury or below seldom, if ever, causes mediastinal emphysema in dogs. Extremely high intrabronchial pressures are necessary to cause emphysema about the neck and face or to cause right cardiac failure in dogs. Pneumothorax may easily occur following mediastinal emphysema. Once emphysema has developed, it may be increased to pressure lower than that necessary to initiate it. PUL MERRILL, M.D.

Adams, W. E. Differential Pressures and Reduced Lung Function in Intrathoracic Operations. *J. Thoracic Surg.* 9:2, 9-34.

Before undertaking intrathoracic operations, it is important to know (a) the vital capacity preceding operation, (b) the functional capacity of the heart and (c) the oxygen-carrying capacity of the blood. It is also important to know the amount of functioning lung during operation, and how to maintain it during and after operation.

These various factors depend upon:

1. The expected diminution of lung function due to removal of or collapse of lung tissue.

2. The amount of blood loss during operation.

3. The amount of diminished respiratory effort.

4. The effect of the operation upon the cardiac output.

The author states that the vital capacity necessary to sustain life in healthy animals is less than 50 per cent and may be less than 5 per cent. Ani-

mals can stand a gradual reduction of vital capacity much better than a sudden reduction. In view of this, when clinical conditions require the removal of lung tissue involving both sides of the chest, it should be much safer to remove the tissue in two or more operations from three to six months apart.

The maintenance of sufficient lung function during a surgical pneumothorax is of paramount importance to the success of the operation. Positive-pressure intratracheal anesthesia permits this. However, this type of anesthesia is attended by certain hazards and disadvantages. Mediastinal emphysema and pneumothorax may occur; these result from tears of the alveolar walls, the air traveling along the vessels in the interstitial tissue to the root of the lung into the mediastinum, and the pneumothorax is secondary to the emphysema.

In experiments on dogs an increasing drop in the blood pressure with increasing intrabronchial pressure was demonstrated. Routinely intrabronchial pressures of 24 mm. of mercury were accompanied by the development of mediastinal emphysema in dogs. I cut the necessary pressure at 20 mm. mercury.

Cases of mediastinal emphysema in humans being during intratracheal anesthesia has been reported.

It takes intratracheal pressures of from 5 to 58 mm. of mercury to produce a rupture of the visceral pleura, but Adams reports mediastinal emphysema following pressures of only 20 mm. mercury in patient.

Because of these dangers Adams uses simple pressure face mask anesthesia for most cases and reserves intratracheal anesthesia for the cases in which large quantities of purulent sputum, in which it is necessary to maintain an adequate trachea and aspirate secretions.

His cautions against the use of high pressures and states that lung re-expansion should be brought about by aspiration of air from the pleural cavity rather than by increase of the pressure of the anesthetic gas. JULIA A. MOORE, M.D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Massone, A. Congenital Superficial Inguinal Hernia (Sull'ernia inguino superficiale congenita) *Clin chir*, 1939, 15 975

From the common inguinal hernia, the superficial inguinal hernia is distinguished essentially by the subcutaneous site of the sac which, instead of descending in the scrotum, is interposed between the superficial and aponeurotic fascia. Kuester, who first described this variety of hernia, did not recognize its congenital nature nor its constant association with anomalies of the testicle and with shortening of the spermatic cord. Consiglio, who recently published an important paper on this subject, believed that this hernia is probably caused by an attitude of hyperextension and hyperadduction of the thighs in utero, associated with an oligopolhydramnios. Such an attitude would be an obstacle to the formation of the scrotum and to the descent of the processus vaginalis, and the latter might follow the route of least resistance, between the superficial fascia and the aponeurosis.

Fourteen cases are presented and the following conclusions are drawn: (1) the Kuester hernia is a rare variety of congenital inguinal hernia which usually becomes apparent after childhood, (2) there were no anomalies in the insertion of the gubernaculum testis in these cases, (3) there was no history suggestive of an oligopolhydramnios nor of any other cause for fetal hyperextension and hyperadduction, and (4) the theory of Consiglio appears the most logical of those that have been offered.

FRANK McDOWELL, M D

GASTRO-INTESTINAL TRACT

Jennings, D. Perforated Peptic Ulcer. Changes in Age Incidence and Sex Distribution in the Last One Hundred and Fifty Years. *Lancet*, 1940, 238 395, 444

All the readily available papers on acute perforation plus "a mass of unpublished material in England and abroad" have been studied by the essayist. He concluded that it is possible for the first time to summarize evidence which leads to the conclusion "that distinct groups of ulcer cases exist. Their incidence varies independently, and that the present common type of pyloric ulcer was relatively uncommon up to recently and that its increase is a true increase and not merely the result of better diagnosis and hospital services." These original conclusions are based upon the assumption that the clinicians early in the 19th Century not only could make an accurate diagnosis of perforated ulcer, but that enough patients with this condition came to them, and they published enough reports to permit statistical evaluation.

The essayist thus goes back to Gerard, who was Professor of Medicine in Paris in 1803, and also quotes material collected from Swedish, German, and English clinics and including Bogan's report in 1937. All of this material from Northwestern Europe leads to the same conclusions. In the early part of the 19th Century and up to approximately 1900, 3 of every 6 free perforations into the peritoneal cavity occurred in young women less than twenty-five years of age, 1 occurred in an elderly woman, 1 in an elderly man, and 1 in a young man. Since 1920, 1 of every 10 perforations has occurred in elderly women and 9 have occurred mostly in middle aged or young men. The perforations which formerly occurred in young women, and formed a sharply defined group, increased rapidly at the beginning of the 19th Century and disappeared completely and suddenly at the beginning of the 20th Century. According to the essayist this type of ulcer must therefore have been due to something in the environment or mode of life.

In addition, perforated pyloric ulcers in men can also be shown statistically to fall into at least two independent groups. One group is closely associated and is inseparable from perforations of the lesser curvature. It has a similar incidence to that of perforation in women since 1920. The other group tends to affect younger men and has recently undergone a large increase throughout Northwestern Europe and the English speaking countries. This increase has been estimated to be from 300 to 600 per cent.

The author promises to discuss the possible environmental factors responsible for the 3 main types of perforation at a later date, and finally urges that perforated peptic ulcers and many other so called constitutional diseases be reported to the health authorities because such statistics would demonstrate transition periods which probably would be of great service in elucidating the causative mechanism and instigate a campaign of prevention.

SAMUEL J. FOGELSON, M D

De Fine Licht, E. The Roentgen Diagnosis of Ileus. *Acta radiol*, 1940, 21 32

During a period of four years there were 142 patients with roentgenological findings resembling ileus at the Gentofte County Hospital, Denmark. There were 50 who were treated with prostigmin. In 33, verified obstruction of the small intestine was present, and in 25 others obstruction of the large bowel was found. There were 22 patients with paralytic ileus, and in 12 evidence of ileus from a variety of causes, such as mesenteric thrombosis, tumor of the pancreas, and trauma to the abdomen, was present. These patients were treated according to their clinical findings.

It was found that the roentgen diagnosis of ileus, when based on the finding of fluid levels, is on the whole of considerable diagnostic value. The mere accumulation of gas in the small intestine does not justify diagnosis of ileus. For prognosis and as an indication for operation the single roentgen examination is of no particular value. It becomes valuable, however, if the examination is repeated, since it is then possible to observe any changes in the degree or extent of the ileus. Whether an ileus is paralytic or mechanical cannot be determined with certainty by roentgen examination except that an opaque enema will not infrequently decide this in the large bowel.

Roentgenological pictures resemble those in ileus are often found after an operation and in cases of abdominal trauma. The absence of fluid levels is rare in ileus and if both fluid levels and abnormal gas accumulation are absent the probability of existing ileus is slight. *STANLEY E. LACHRY, M.D.*

Tosonotti, T. Primary Simple Ulcer of the Small Intestine (*Ulcera semplice primitiva del tenue*). *Polidina, Rome, 949, 47 sez. chir. 30*

Tosonotti adds 1 case of simple primary ulcer of the small bowel to the 75 broadly reported in the literature. These were found for the most part in the ileum and were classified as acute or chronic. The former type was described for the first time in 1831 by Leontis as a clearly demarcated area of necrosis in which signs of inflammation are absent or minimal, consisting at most of a slight margin of infiltration. The chronic type on the other hand, was characterized by extensive induration involving the margins and base of the lesion, as well as contiguous portions of the bowel wall, and frequently causing adhesions with approximated loops of gut.

The jejunal ulcer presents a syndrome which is predominantly dyspeptic. It is characterized by anorexia, acid eructations, occasional vomiting, and pain which usually comes on some time after eating and may be burning or cramp-like. This pain is referred to the epigastrium and left upper quadrant. It is brought out by deep palpation and alleviated by alkalis. Hematemesis and melena may be present. These features, with negative roentgen examination of the stomach and duodenum, should direct suspicion toward the jejunum.

In the ileum on the other hand, the simple ulcer is manifested by sudden crises of colic localizing in the lower abdomen in the left or right quadrant, diarrhea, and possible melena. Here, too, the pain is periodic and interspersed with periods of remission. It is plain that in the latter case differentiation will be difficult from perforation of an out-pouch or a Meckel diverticulum. The etiology and pathogenesis of this lesion of the peptic ulcer are controversial. The author believes that the cause is primarily vascular and as basis for his conviction point out that the small vessels which supply the intestine are essentially end arteries and their occlusion would result in infarction. Further the

round form, somewhat coned out. Its clear margins as if punched out in normal mucosa, and the sudden onset without history of intestinal disturbances offer further evidence of vascular etiology. It is further hypothesized that toxins such as alcohol and nicotine which are excreted through the gastrointestinal tract may play a secondary rôle in the development of such lesions. The interesting suggestion has been made in this connection, as in the case of ileus occurring in Meckel diverticula, that they are due to ectopic islands of gastric mucosa. There are many reports, however, in which histological examination has failed to reveal such evidence. The treatment for this entity is strictly surgical, because of the marked tendency toward ulceration which characterizes the lesion. *EDMUND GAVENOUR, M.D.*

Westerman, G. J. J. The Role of Surgery in the Management of Duodenal Ulcer (*Am. Surg. 949, 337*)

A surgical procedure for any pathological condition must fulfill the following requirements: if it is to be successful, satisfactory immediate recovery, brief uncomplicated convalescence, early return to usefulness and permanency of cure. Sixty-four consecutive cases of chronic duodenal ulcer treated by gastro-enterostomy were studied to determine to what degree this procedure fulfilled these stipulations.

The objections of the majority of surgeons at the present time to posterior gastro-enterostomy in the treatment of chronic duodenal ulcer is based almost entirely upon the fact that it is so frequently followed by jejunal ulcer. The literature favoring gastric resection, however, shows no distinction between partial gastric resection and subtotal gastric resection. That partial resection is frequently followed by jejunal ulcer is already recognized, and subtotal resection without immune to this complication. However, while subtotal gastrectomy is a satisfactory operation and fulfills the last requirement, the immediate mortality and postoperative complications will never be eliminated. The author cannot agree with the surgical teaching which recommends subtotal gastrectomy as the only procedure for cure of chronic duodenal ulcer. In the hands of those with less experience smaller portions of the stomach will be resected and the mortality and immediate complications will be high without even a chance of permanent cure.

Gastro-enterostomy, not haphazard anastomosis between some part of the posterior gastric wall and the jejunum but definite well planned, carefully placed opening between certain limited areas of the stomach wall and corresponding segment of the jejunum. A few of the important features are: (1) the stomach is cut along a line from the lesser to greater curvature, obliquely down and from left to right; (2) the lower angle of the stomach falls below a line bisecting the body of the stomach; (3) the serosa of the jejunum is buttressed; (4) serosa of the stomach for an inch above the upper angle of

the stoma, (4) the opening in the lesser sac is affixed to the stomach wall above the stoma, (5) the jejunal site is arbitrarily taken to allow the jejunum to fall naturally without angulation when the stomach is replaced, and (6) the size of the opening will vary with the size of the stomach, but will not be less than $1\frac{1}{2}$ in in diameter. No clamps and no non absorbable sutures are used. All bleeding points in the stomach and jejunal walls are tied. Two sutures are used, one continuous for the serosa, and one of a self-inverting type for the mucosa. It is important not to place the stoma near the pylorus.

In the author's series of 64 consecutive cases there were 2 postoperative deaths (3.12 per cent). One followed wound disruption and a pulmonary complication following resuture of the wound. The second was secondary to obstruction of the distal jejunal loop from dense adhesions. The results were unsatisfactory in 5 patients (7.6 per cent). One patient developed a definite jejunal ulcer, which was proved at autopsy. It was possible to follow 54 cases continuously after operation. Thirteen of the patients were followed for ten years or longer, 25, from five to ten years, and 16 from one to five years. From the results obtained in these patients the conclusion is drawn that posterior gastroenterostomy in the surgical management of duodenal ulcer has met the specified requirements essential to justify continuance of its use.

SAMUEL J. FOGELSON, M.D.

Rossi, V. Isoperistaltic Supraduodenal Choledochoduodenostomy Indications, Technique, and Late Results (*La coledoco duodenostomia sopraduodenale isoperistaltica. Indicazioni, tecnica e risultati lontani*). *Arch. ital. di mal. dell'appar. digerente*, 1939, 8, 419.

The author briefly reviews the historical development of choledochoduodenostomy. Until 1899, there were only 2 successful cases (those of Kocher and Sprengel). The bad results which may follow the procedure are discussed.

The various indications and contraindications are stated. The most common indications are malignant lesions of the common bile duct, intraluminal obstruction of the common duct, chronic pancreatitis, congenital or cicatricial stenosis of the common duct, spasm of the sphincter of Oddi, and tumors of the papilla of Vater or of the head of the pancreas. Contraindications may be present as in patients in whom the common bile duct and duodenum cannot be exposed sufficiently because of adhesions, in patients who are poor risks or those with serious hepatic insufficiency, and in patients with marked changes in the wall of the duct because of purulent processes.

The technique, as described by the author, consists of exposing the supraduodenal part of the common bile duct by a longitudinal incision and mobilizing the hepatoduodenal ligament (Fig. 1). The wall of the common bile duct is then attached to the duodenum in an isoperistaltic manner by a continuous suture of catgut for a distance of about 3 cm. The common bile duct and the duodenum are

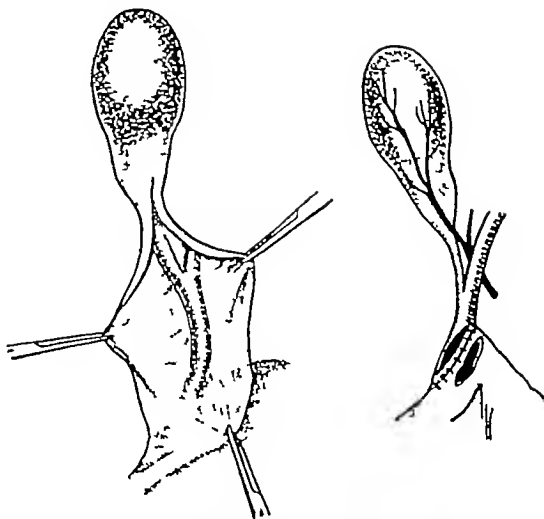


Fig. 1. Left. Opening of hepatoduodenal ligament and exposure of the retroduodenal portion of the common bile duct.

Fig. 2. Author's technique of anastomosis of the common bile duct to the duodenum.

incised longitudinally and parallel to the first row of sutures, a stoma which is larger than one made by transverse incisions thus being formed (Fig. 2). Closure of the anastomosis is accomplished in the classical manner with the use of continuous catgut sutures. Cholecystectomy is almost always done as a final stage.

The author states that from July, 1930, to August, 1938, this procedure was performed in 55 cases: 13 (23.6 per cent) males and 42 (76.4 per cent) females. The ages ranged from fourteen to sixty-six years with the largest number in the fourth decade. There were 7 (13.7 per cent) deaths. Of the surviving 48 patients, 23 are in good health, 5 died of intercurrent diseases, 1 died of carcinoma of the pancreas, and 1 of persistent icterus. Of 41 patients, 28 (68.3 per cent) were cured, 6 (14.6 per cent) were benefited, 3 (7.3 per cent) presented fair results, and 4 (9.8 per cent) showed no improvement in their condition.

MICHAEL DEBAKEY, M.D.

Marshall, S. F. Regional Ileitis. *New England J. Med.*, 1940, 222, 375.

Benign, non-specific, granulomatous tumors of the bowel and inflammatory tumors of the bowel were problems of the physician for many years. From the time of Senn's description of inflammatory bowel tumors (1895) up to the present day, the literature contains many instructive reports, all leading more or less to the present study.

The author's paper is based on 48 cases of regional ileitis observed at the Lahey Clinic, Boston, during the last six years. Clinical data and roentgenological findings were the basis of the diagnosis. In twenty-



The Roentgen ray findings in regional ileitis. The patient was a man, aged twenty-six, with symptoms for over six years. The small bowel is obstructed by contracting process. Note the marked narrowing ("string sign") of the terminal ileum. The arrow points to fistulous tract between adherent involved loops of ileum. Operation: 1) o-stage resection of the ileum and ascending colon, as followed by recovery.

young patient who were operated upon, the diagnosis as confirmed by pathological examinations of the resected segments of bowel. From Crohn's first description of regional ileitis, it was thought that the lesion was confined to the terminal ileum. Since that time observers have learned that it may be found anywhere in the ileum, jejunum, or colon. It does not always occur in continuous inflammatory process as frequently normal segments of bowel may intervene between the diseased portions. Because of this newer observation, the term "regional ileitis" has been replaced by "contracting enteritis," "regional enteritis," "chronic ulcerative enteritis," and "non-specific granuloma of the intestine." The pathology varies with the stage of the disease. In the early stage the bowel is thickened and hyperemic; there may be edema of the bowel wall and at the mesentery and enlarged lymph nodes. In the common chronic process, all layers of the bowel wall are involved; they are characterized by mucosal keratinization and

by great thickening of the submucosal and muscular layers. Infiltration of all intestinal coats with mononuclear cells is found especially in the mucosal layer. Giant-cells occur at times and frequently imitate the picture of a tubercle. The bowel lumen is reduced by extreme thickening of the bowel wall and by cicatricial contractions. Ulcerated areas may perforate and result in abscesses and fistulas between adherent loops of bowel, or to the exterior through the abdominal wall. A diagnosis of tuberculosis of the terminal ileum and cecum has frequently been made in this disease, but tubercle bacilli have not been found. The disease is chronic, progresses insidiously and develops a palpable abdominal mass, with complications as noted. Its cause is not established, but dysentery bacillus, lymphatic disease of the mesentery, lymphadenitis of early childhood, and other conditions are suggested.

Symptoms of regional ileitis are pain in the right lower quadrant, associated with nausea, diarrhea, loss of weight, and anemia; later a palpable mass in the abdomen may be felt. The course is that of a chronic progressive inflammatory process persisting for months or even years. The onset is easily interpreted as an acute appendicitis. Many errors can be avoided by carefully examining the ileum when the findings of appendicitis are not definite at operation. Symptoms of intestinal obstruction, though not complete, are not uncommon; patients complain of distention with crampy abdominal pain and vomiting. Roentgenological examination often shows constrictions in the lumen of the bowel, with dilated loops proximal to the area of stenosis. The usual complications are internal or external fistulas and perforations into adherent loops of bowel or through the anterior abdominal wall with all the concomitant discomforts.

Roentgenological examination will give positive evidence of the diagnosis (See Fig. 1).

Ileocolostomy versus radical resection has been much discussed. Spontaneous remission of the disease occurs in many cases; this fact appears to support ileocolostomy. However, in advanced cases with marked granulomatous changes, stenosis, obstruction, and ulceration, the only permanent cure is resection of the affected segment of bowel. If the small intestine is greatly involved in many areas, medical treatment must be given as little as possible, accomplished by surgery and the condition will continue to get worse. Operation in very acute regional ileitis should be avoided if laparotomy becomes necessary to establish the diagnosis or to rule out appendicitis. The abdomen should be closed without intra-abdominal surgery or after simple ileocolostomy is done. Appendectomies done in the presence of acute regional ileitis often result in external fistula formation. Lahey prefers the difficult resection of the terminal ileum, cecum, and ascending colon in a one-stage operation. It is by far the safer procedure. Forty-eight patients with regional ileitis were observed during a period of seven years. A one-stage method of resection was the

operation of choice In 22 patients, resection of the involved loops was done without a fatality Of 29 patients who were operated upon 2 died

MATHIAS J SEIFERT, M D

Beluffi, E L A Case of Perforating Acute Terminal Ileitis Associated with Submucosal Fibromyoma of the Terminal Ileum (Su un caso di ileite terminale acuta perforativa associata a fibromioma sottomucoso dell'ileo terminale) *Clin chir*, 1940, 16 65

Beluffi discusses the case of a man, aged thirty-six years, who for three days had suffered from abdominal pain in the region of the umbilicus, accompanied by vomiting and moderate abdominal defense of the right quadrants, when he suddenly developed the typical symptoms of intestinal perforation The diagnosis of peritonitis due to acute appendicitis was made, but at operation the appendix was found to be normal, while the last portion of the ileum was markedly inflamed and presented several perforations and ulcerations over a tract of 20 cm, beginning just beyond the ileocecal valve A submucosal fibromyoma, the size of a large nut, was discovered about 8 cm higher up Entero anastomosis was performed and the patient died three hours after the intervention Necropsy revealed no special lesions of the parenchymatous organs or of the ileum higher up, except for a moderate hyperemia of Peyer's patches Histological examination of the resected portion showed that the mucosa was greatly thickened and was the seat of a fibrous purulent hemorrhagic infiltration which reached its greatest intensity in the submucosa and decreased gradually in the other layers The slightly swollen Peyer's patches did not present any particular histological characteristics Cultures of the contents of the involved intestinal loop developed an enterococcus, those of the spleen were negative Widal's test was negative

The perforations were not due to thrombo-embolic circulatory changes, incarceration, compression anemia, trauma, or worms Typhoid was excluded by the history, the symptoms, the histological examination, and the negative Widal test The perforations could not be attributed to "simple or round ulcer of the small intestine" The type of the observed changes left as the only possibility the diagnosis of perforating primary acute terminal ileitis

Similar acute primary phlegmonous changes in the terminal ileum have been reported by various authors during the past years, they showed the same characteristics as in the present case, but no perforations, and nearly all of the cases came to operation with the diagnosis of acute appendicitis However, various cases with perforation have also been described, and it must be admitted that the tendency toward perforation is one of the basic characteristics of terminal ileitis, but the slowness with which the perforation occurs allows the necessary time for the involved part to contract adhesions with the neighboring organs Perforation in acute cases cannot be considered as an exception, it depends more on the rare

coincidence of aggravating factors The site of predilection of the perforations seems to be the mesenteric border

The cause of the present case is not clear, the bacillus coli and enterococcus were found, but they were not in sufficient numbers to be responsible for the changes The lesions of the mucosa suggested that they were secondary to a submucosal process A hematogenous origin cannot be excluded because the patient had had angina with fever shortly before developing the ileitis, and similar cases have been reported Besides, the ileoceco-appendicular segment is more exposed to infectious attacks than the other parts of the intestine It did not seem that the presence of the fibromyoma had had any influence on the pathogenesis of the disease

As spontaneous resolution of acute ileitis appears to be practically the rule, it is permissible to abstain from any intervention, in case of occlusion, operation is indicated, preferably enterostomy If the lesions are serious and do not regress, resection in one stage followed by ileo ileostomy or ileocolostomy is the ideal intervention

RICHARD KEMEL, M D

Ravenel, W J Submucous Lipoma of the Large Intestine, with Case Report *Radiology*, 1940, 34 217

A submucous lipoma of the large intestine is a quite uncommon fatty tumor which arises external to the muscular layer of the gut and protrudes into the lumen of the bowel It is benign, but is often confused with a carcinoma Such tumors usually appear singly, but they may be multiple and vary in size from 1 to 12 cm The average size seems to be 4 cm in diameter They may be sessile or pedunculated, and lobulated, rounded, ovoid, or pyriform

The symptoms are exceedingly variable There may be bleeding, vague pains in the abdomen, and obstruction Intussusception is usually responsible for the obstruction because it interferes with peristalsis Obstruction may be due to the size of the tumor protruding into the lumen, and the tumor may become swollen as a result of interference with the blood supply

Carcinoma is usually the diagnosis that is made because of the loss of weight, bleeding, and low hemoglobin estimation which usually accompany the tumor Of these lipomas, 72 per cent are said to occur in the cancer age Occasionally the tumor can be demonstrated to be polypoid by x-ray examination The long duration of the symptoms or the finding of a polypoid tumor at x-ray examination may suggest a benign lesion However, the most common polyp of the colon is the adenoma which may undergo malignant degeneration A definite diagnosis can be made only when the tumor can be seen through a proctoscope, or after it has prolapsed externally At operation, an excision may be done if a positive diagnosis can be made

Over 50 per cent of these lipomas were found in individuals between forty and sixty years of age Lipomas in other parts of the body are found during

the same period of life. At this time in life there is an increased activity in the growth of general adipose tissue which is of diagnostic importance, in the time of appearance of these growths coincides with that of carcinoma.

The treatment is surgical removal, in or tapes. A colectomy may be done as the first step and resection the second. The Mikulicz operation is probably the procedure of choice for the most of the transverse, descending, or sigmoid colons. Lipomas of the rectum may be resected through proctoscope.

The author reports case in detail.

JOSEPH E. NARA, M.D.

Dennis, C., B. Irig, R. E., and Wagners, O. H.
An Inquiry Into the Functional Capacity of the Cecal Appendix in Representative Birds and Mammals. *Surgery* 1940, 7, 37

The authors outline their commendable investigations of the obstructive factor in the production of appendicitis.

Experimental studies were made of the absorption and secretion of fluid by the cecum, and cecal appendage when present, in the duck, goose, chicken, pigeon, dog, fox, raccoon, bear, lunk, rat, tiger rabbit, squirrel, ground squirrel, rat, porcupine, hog, sheep, calf, marmoset, ring tailed monkey, macaque, gibbon, chimpanzee and man.

The rabbit, gibbon, chimpanzee and macaque possess cecal appendage. All of these but the gibbon fluid secretion by the appendix is sufficiently greater than fluid absorption to produce an increase in intraluminal pressure adequate to cause gross and microscopic evidence of acute inflammation.

In all animals which do not possess cecal appendage and in the gibbon, fluid secretion in excess of absorption was not observed.

The authors conclude that increase in the intraluminal pressure secondary to obstruction of the appendiceal lumen is probably an important factor in the etiology of acute appendicitis.

EDWARD W. GIBBS, M.D.

Faria, C. Anatomoclinical Contribution to the Study of Mucocoele of the Appendix (Contributo anatomoclinico al studio del mucocoele appendicolare). *Chirurgia* 1940, 4, 2.

The author cites case of mucocoele of the appendix which had its origin in simple inflammatory process of the appendix, the cecal insertion, and which the background as quite characteristic of chronic interstitial inflammatory process. It seems probable that the process began as an endotyphlitis and that bacterial toxins or attenuated bacteria penetrated the covering epithelium of the tissues surrounding the base of the appendix. The resultant hyperproliferation of mucosa and reparative connective tissue processes finally blocked the appendiceal lumen.

After studying some of the cases in the literature, the author wishes to reserve the term peritoneal

pseudomyxoma for those cases originating from the plants of the contents of cystomas of the ovary. He interprets the reaction to mucus from an appendiceal mucocoele as being a form of hyperplastic peritonitis.

F. McDONELL, M.D.

Filippini, G. Studies on the Role of Retractable Sigmoiditis in the Production of Volvulus (Ricerche sperimentali sul ruolo della retrattile sigmoidite nel determinismo del volvolo). *Sperimentale*, 1940, 93, 53.

The author analyzes the anatomical changes of the sigmoid loop and associated mesentery predisposing to the formation of volvulus, and lists them as follows: (1) those referable to the gut (segmentation, redundancy and megasigmoid), and those referable to the mesentery (abnormal divisions and ligamentous bands, anomalies of insertion, and retractile meso-sigmoid). After discussing the implications of these factors and reviewing the work of other investigators, Filippini reports a series of experiments performed on rabbits in which a condition similar to retractile mesenteritis was artificially produced and the results were studied. In each animal, large collecting veins which crossed the extreme superior margin of the mesenteric insertion, were isolated and tied off below the anatomical arch, care being taken not to disturb the artery. Following this, 0.5 cc. of 1% aluminum silicate was injected between the layers of the mesentery, the material being distributed insofar as possible at the base of the mesentery. Finally, the two ends of the loop were lightly approximated and the insertions loosely joined by ligatures made with human hair suitably sterilized.

Eleven rabbits divided into two groups, were treated in this manner in the second group, however, the injection of silicate was omitted, as well as the approximation of the ends of the loop. In this control group, in which only the vein had been ligated and the histological picture of mesenteric congestion alone was produced, no volvulus developed and no signs of obstruction were observed. In the other 6 experimental animals, retraction of the mesentery resulted in 3 cases thus closely resembling the mesenteritis noted in volvulus occurring spontaneously in the human being. It is concluded, therefore, that although volvulus does not appear constantly, mesenteric retraction of the mesentery is present in a high percentage of cases. The factors of redundancy and megasigmoid were thought to be of minor importance, although of definite predisposing value. The approximation of the extremities of the loops was also indisputably of importance in the production of the lesion, but it was not effective alone. It was noted that volvulus never occurred before the fifteenth or twentieth day, at which time the inflammatory process at the base of the mesentery was well organized, the natural elasticity was markedly impaired, and the vascular supply of the loop was embarrassed. Retraction and fibrosis of the sigmoid mesentery is therefore believed primary cause of volvulus.

EDWARD F. SWANSON, M.D.

Cattell, R. B., and Swinton, N. W. *The Diagnosis and Treatment of Sigmoidal Polyps* *New England J. Med.*, 1940, 222: 535

Although considerable attention has been given to cancerous lesions of the large bowel in recent years and the principle of radical removal has been accepted as the method of choice, insufficient attention has been given to intestinal polyps or premalignant lesions.

Cattell discusses his experience with 10 cases of sigmoidal polyps. During this same period of the past seven years, there were 156 patients with polyps of the rectum and colon who were treated. During this same period 827 patients were operated on for carcinoma of the colon or rectum. A careful study of the removed lesions showed that 120 (14 per cent) could be proved histologically to have arisen from benign mucosal polyps. All stages of cellular change incident to the development of true carcinoma could be demonstrated in the various polyps removed. The frequent development of cancer in patients with congenital polyposis of the colon has long been known.

Bleeding was the presenting symptom in all 10 cases with sigmoidal polyps. In 6 instances the bleeding had been present for from one to fifteen years. One patient had obstructive symptoms because of the size of the polyp. Proctoscopic and sigmoidoscopic examination prove of the greatest value diagnostically. It is important to have the patient in the inverted position so that the rectosigmoid will become straightened by gravity and the instrument can be passed into the lower sigmoid. Barium enema and double contrast air enema will often be necessary to demonstrate the discrete polyp. Repeated examinations may be required.

The treatment of rectal polyps is a relatively simple problem. Those below the pelvic peritoneal reflection can be fulgurated under direct vision, all polyps in any part of the large bowel should be destroyed or removed. Those above the pelvic peritoneal reflection can be fulgurated successfully if great care is exercised to avoid perforation and bleeding.

The treatment of polyps of the sigmoid is a more serious problem. Cattell believes that all sigmoidal polyps should be removed by laparotomy. Thorough examination of the entire colon should be routine. Polyps can often be palpated through the sigmoidal wall and moved back and forth through the lumen. Induration or fixation of the polyp makes the diagnosis of cancer and demands resection. After carefully walling off the segment of involved bowel containing the polyp, a longitudinal incision 3 in. long is made in the tænia coli band. The polyp is excised with a generous portion of the mucosal base where the pedicle is free. The incision is next closed with fine silk sutures in two layers. In 4 of the 10 cases, the incision was reinforced with the appendices epiploicæ. In 1 instance the entire incision was made extraperitoneal by incising and reflecting a strip of lateral peritoneum.

Histological study of the 12 polyps removed from 10 patients by sigmoidotomy showed malignant adenoma in 1, adenocarcinoma in 2, while in 2 others there was a small focus of malignant change present in the polyp. In none was there any evidence of extension into the pedicle. In no case could cancer be determined from the gross appearance. The presence of early malignancy in 5 of the 10 instances furnishes striking evidence of the importance of removal of all sigmoidal polyps as soon as their presence can be demonstrated.

Postoperative convalescence was satisfactory in all cases, there being no complications and no mortality. One patient developed a carcinoma of the transverse colon distal to the hepatic flexure four and one-half years after the sigmoidotomy. This was removed by a modified Mikulicz type of resection. The 9 other patients remained well for the period of observation.

JOHN W. NUZUM, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Rosenberg, D. H., and Soskin, S. *The Azorubin-S Test of Liver Function, An Evaluation, with a Comparative Study of the Bromsulphalein and Hippuric-Acid Tests* *Ann. Int. Med.*, 1940, 13: 1644

Few tests of liver function have proved to be of much value in the diagnosis and prognosis of diseases of this organ because of the number of liver functions, as well as the great regenerative capacity and functional reserve of this organ. However, any test which might elicit information concerning a single function deserves study.

Azorubin-S, a dark red, stable, water soluble dyestuff of the mono azo group, was first introduced as a substance suitable for the testing of hepatic function by Tada and Nakashima in 1924. They injected it intravenously and by duodenal intubation, and observed the color changes in the bile. In normal subjects as much as 95 per cent of the dye was excreted in the bile, the remainder being eliminated in the urine. Thus, renal disturbances can exert only a negligible influence upon its excretion by the liver. A delay in appearance of the dye in the bile or a prolonged urinary excretion was regarded as of pathological significance. The substance was found to be harmless and devoid of untoward effects, and when compared with 62 other dyes (bromsulphalein was not included in their study), yielded more reliable results.

The azorubin-S test is performed as follows:

After an overnight fast, a narrow flexible tube is passed into the duodenum and its position confirmed fluoroscopically. When bile begins to flow through the tube, 4 c.c. of sterile 1 per cent aqueous solution of azorubin-S are injected intravenously. Five minutes later, 40 c.c. of 25 per cent aqueous magnesium sulfate solution are administered through the duodenal tube. The duodenal contents are collected in separate test tubes at one- or two minute inter-

vial, and the time elapsing between the injection of the dye and the appearance of very deep red is designated as the appearance time.¹¹ For color determinations and comparisons the best results are obtained by observing the solutions in bright daylight slanting the tube against white background is also helpful.

In normal individuals usually a succession of color changes in bile was noted in the following order: orange, reddish-orange, light red, light cherry red, and deep cherry red, after which the color faded out in the reverse order. The appearance time of the significant test color (deep cherry red) ranged from seven to twenty-nine and one-half minutes, whereas the time elapsing before the first appearance of the dye, however faint, varied from eight to twenty-five minutes.

The technique of the azorubin S test lends itself to a combined study of liver function and composition of the bile. The coexistence of cholelithiasis with hepatic cirrhosis is not uncommon, the reported incidence being as high as 3 per cent. Upper abdominal pain may be the predominating symptom in either disease, yet the finding of non-visualizing gall bladder cholecystographically may be of no diagnostic significance in the presence of cirrhosis, which often leads to erroneous conclusions. In these cases the establishment of the presence of calculi, which is of importance therapeutically may be impossible without crystallographic study of the bile. A combined liver function test and bile examination is thus advantageous.

The azorubin S test of liver function, which has received little attention in this country as performed on 3 normal subjects and comparative study of this test with the bromsulphalein and hippuric acid tests was made in 9 cases of cirrhosis, 1 case of acute toxic hepatitis, 1 case of subacute toxic hepatitis, 1 case of fatty metamorphosis of the liver and 4 cases of relatively early chronic hepatitis. The azorubin-S test as found to be as reliable as the bromsulphalein test and better than the hippuric acid test in cases of cirrhosis, while in the cases of relatively early chronic hepatitis the azorubin S test was superior to both the other tests.

Although the azorubin S test requires duodenal intubation, the method lends itself to simultaneous crystallographic study of the bile.

MARCEL E. LACROIX, M.D.

MISCELLANEOUS

Faxon, H. H. Subphrenic Abscess. *New England J Med* 940, 259

A series of 75 cases of subphrenic abscess is presented, and the anatomy of the subphrenic spaces is discussed. It is the author's opinion that lack of familiarity with these constant anatomical spaces often leads to an unwise selection of approach for drainage and to an unfortunate hesitancy in the execution of an operation. The left subphrenic area is less commonly involved than the right, there being

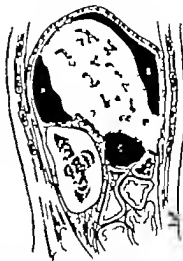


Fig. 1. Sagittal view of the right abdomen. This shows the relative sites of abscesses occurring in the three most commonly involved subphrenic spaces. A, right posterior superior; B, right anterolateral; C, right inferior.

only 3 per cent of this series in which an abscess was found to the left of the midline.

With reference to the cause, Faxon believes that vast majority of subphrenic abscesses originate from an extension of intraperitoneal sepsis, although in some instances infection may occur by way of the lymphatics and the blood stream. In this series the origins of the infection were the appendix in 31 per cent, the stomach and duodenum in 27 per cent, the liver and bile passages in 1 per cent and the other sources combined in 3 per cent.

In the early stages this is not always easy to diagnose; the condition of subphrenic abscess is a case in which subphrenic abscess is likely possibility the diagnosis is made on one or more of the following points: the presence of tenderness upon firm palpation over the twelfth rib or lower costal margin; clinical findings of high, fixed diaphragm on the affected side; pain referred to the shoulder or neck, hiccoughs, and discomfort on deep respiration and confirmation by roentgenological studies. Faxon's statistics substantiate the statement that, regardless of the space involved, if the diaphragm can be visualized by rays it will almost invariably be found to be elevated and, usually, fixed. The author believes many physicians are inclined to neglect obtaining a satisfactory lateral roentgenogram or making adequate fluoroscopic studies, and he considers the evidence secured by these means of inestimable help. In 5 of the cases in this series the infection of radiopaque substance into a abscess tract persisting from previous operative drainage demonstrated the location of residual subphrenic abscess. The belief that the abscess must almost always be in direct contact with the diaphragm to

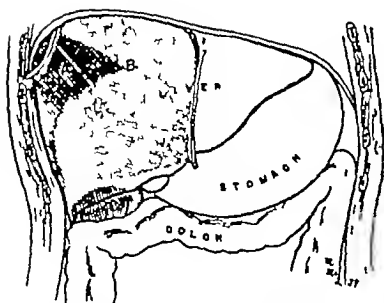


Fig. 2 Anterior view of the abdomen. This shows the relative sites of abscesses occurring in the three most commonly involved subphrenic spaces. A, right postero-superior, B, right anterosuperior, C, right inferior. The shaded portions of A and C are actually not visible in this view as they lie behind the substance of the liver.

give pleural effusion above it is supported by the findings in this series. Downward displacement of the liver is held to be suggestive of an abscess in one of the superior spaces.

Pre operatively, determination of the space or spaces involved can be accomplished by an observance of the following: location of the point of maximum tenderness, the x-ray findings, consideration of the original septic process, and aspiration of pus from a suspected area beneath the diaphragm. However, the author considers the latter a pernicious practice that should be condemned. Thoracentesis of the pleural cavity may be carried out to advantage in certain cases.

The treatment of subphrenic abscess lies in prompt drainage of the area. A discussion of the various methods of approach is given, and the author concludes that the retroperitoneal type is the safest, since the theoretical and statistical evidence favors it. Contamination of the pleural or peritoneal cavities at the time of operation more than doubles the mortality rate, and such contamination occurs far more frequently with the transthoracic and transperitoneal types of approach than with the retroperitoneal operation. EARL GARSIDE, M.D.

Lehman, E. P., and Boys, F. The Prevention of Peritoneal Adhesions with Heparin. An Experimental Study. *Ann Surg*, 1940, 111, 427.

This contribution to the problem of peritoneal adhesions merits studious attention. As a means of prevention of peritoneal adhesions, the authors endeavor (1) to destroy fibrin and (2) to prevent its formation. They describe the manner in which an exudate on the peritoneal surface leads to adhesions: the exudate, serous or seropurulent, becomes fibrinous, the fibrin is then organized by connective-tissue and blood-vessel elements of the subserosa. This process always takes place in fibrin and cannot occur without fibrin. It is claimed that heparin prevents the formation of fibrin in the blood. Based upon this hypothesis, the authors conducted various

experiments. They state, "Heparinization of animals and man, in vascular surgery, to an extent that is effective in preventing thrombosis, has not been found to be hazardous from the point of view of wound hemorrhage, if complete hemostasis is obtained at the time of closure."

Their report includes the protocols of 56 rabbits, 30 dogs, and their controls.

Two sets of experiments were carried out with corresponding controls, one with rabbits and one with dogs. In rabbits, the adhesions were produced by mechanical damage and by bacterial contamination. The adhesions were then separated and the degree of their re-formation observed. All surgery was performed upon rabbits anesthetized by local infiltration with 1 per cent novocaine. The dogs were given ether intratracheally. Scrupulous asepsis and extreme gentleness were employed. Fine silk was used for the intraperitoneal ligature. The incision was made through an untouched area of the abdominal wall whenever a repeated survival celiotomy was indicated. Closure of the incision always avoided the exposure of cut surfaces and prevented suture material from presenting within the abdominal cavity.

RABBITS

Adhesions caused by mechanical damage. A pledget of folded dry gauze of constant dimensions was introduced close to the angle between the mesial surface of the cecum and the lateral surface of the ileum after light dry-gauze scarification of the underlying serosa. This was anchored by 2 fine silk serosal sutures. In from three to five days later the abdomen was opened and the pledget and sutures were removed. The animals were divided into 3 control groups and 1 experimental group.

In the first control group the abdomen was closed after separation of the adhesions without the intraperitoneal administration of any solution. In the second control group 25 c cm of normal saline solution were left in the peritoneal cavity, and in the third control group 25 c cm of amniotic fluid were administered intraperitoneally before closure.

In the experimental group 25 c cm of normal saline solution containing 750 units of heparin (30 mgm per cent) were injected into the peritoneum. The injections in all groups were repeated by paracentesis on the first and second postoperative days. One week later all animals were examined for the presence or absence of adhesions.

Adhesions caused by peritoneal contamination. At the first operation the appendix was perforated near the tip and its contents were smeared over adjacent serosal surfaces. Also, various solutions were injected intraperitoneally in spite of an unclosed opening of the appendix. All experiments were carried out as noted, except in the amniotic-fluid control group.

DOGS

Adhesions caused by peritoneal contamination. The treatment of the appendix in dogs was the same as that carried out in rabbits. Forty per cent of the

dogs died from peritonitis and per cent developed localized abscesses these dogs are not included in this report Six weeks later the abdomen was opened and the resulting adhesions were counted carefully and completely divided by sharp dissection Bleeding was controlled by hot pack or by fine polt ligation with silk At this time, in the rabbits, 3 control groups and heparin experimental group were established One hundred cubic centimeters of normal saline 100 c.cm. of amniotic fluid, and 100 c.cm. of heparin solution (3,000 units) were introduced into the peritoneal cavity of the proper groups, respectively Injections were repeated by paracentesis on the first and second postoperative days Two weeks later re-formation of the adhesions was observed and count was made at final celiotomy In counting the adhesions in dogs, continuous adhesive band or sheet was considered as single adhesion In most instances these probably represented the fusion of many smaller adhesions

In rabbits, after mechanical peritoneal trauma there was striking difference between the numbers of adhesions in the controls and in the animals treated with heparin The controls yielded adhesions in 100 per cent, while the experimental group (heparin) yielded adhesions in only per cent Adhesions after peritoneal contamination in the control groups amounted to 100 per cent the experimental groups (heparin) yielded no adhesions

The results in dogs were not so good In 30 controls the average number of adhesions, divided two

weeks later amounted to 8 per cent The average number of adhesions which reformed ten weeks later amounted to 6 per cent (57 per cent) In 10 dogs in the experimental group the average number of adhesions which reformed, divided, amounted to 0.7 per cent the average number of adhesions which reformed was .6 per cent (26 per cent)

It is a striking observation that normal saline solution injections resulted in more than twice the usual number of adhesions

The coagulation time of the blood (determined by capillary tube method) in dogs following the intraperitoneal injection of heparin lengthened to ten minutes, to 6 hours after injection, and lasted about eight hours A rapidly developing polymorphonuclear leucocytosis appeared in dogs during the first twenty-four hours after heparin injection Twenty-four dogs developed massive intra-abdominal hemorrhage from which they died one of these died of paralytic ileus

Although the number of experiments is inadequate for positive deductions, there can be no doubt that heparin has proved to be astonishingly effective in preventing adhesions As yet, research does not warrant the application of heparin treatment to patients, but future developments are hoped, will permit clinical application

The authors conclude that heparin introduced into the peritoneal cavity of the dog and the rabbit is effective in preventing the formation and re-formation of adhesions

MARTIN J. SHERMAN M.D.

GYNECOLOGY

UTERUS

Koeberle, F. Internal Adenomyosis of the Uterus with Tuberculosis (Ueber Adenomyosis uteri interna tuberculosis) *Wien klin Wchnschr*, 1939, 1 122

In the world literature there are, up to the present, 21 established observations of adenomyosis of the uterus with simultaneous tuberculosis. The ideas concerning the combined appearance of both diseases vary. While some assume a coincidental occurrence of both diseases, others believe in a secondary infection in a predisposed patient. Robert Meyer and Schottlaender are of the opinion that the uterine adenomyosis is the sequel of tuberculous infection.

The author's case concerns a forty-six-year old married woman who had twice given birth and who had twice aborted. After unsuccessful curettage because of long continued irregular bleeding, in the presence of histologically proved mucous membrane tuberculosis, the uterus and both adnexa were surgically removed. The anatomical study of the operative specimen showed a combination of adenomyosis and tuberculosis in the uterus with a healed tuberculosis of the right tube. On the basis of the local association of the two processes a causal connection of both diseases was assumed, in the sense that in the presence of a tendency toward adenomyosis changes in the endometrium the tuberculosis was the exciting cause for the internal adenomyosis of the uterus. (HUBER) JOHN R. PAINE, M.D.

Fricke, R. E., and Bowing, H. H. Radium Treatment of Carcinoma of the Cervical Stump. *Am J Roentgenol*, 1940, 43 544

Carcinoma of the retained cervix, subsequent to a supravaginal hysterectomy, is a very serious condition. When discovered most of the lesions are in advanced stages and the prognosis is poor. This condition occurs at the time of the menopause, or slightly later, and occurs most often after a subtotal hysterectomy for uterine fibromyomas. Undoubtedly, as Branscomb has suggested, when uterine myomas are known to be present in cases of vaginal bleeding, investigation of possible causes of vaginal bleeding other than uterine myomas may not be considered, and a coincidental cancer of the cervix may be easily overlooked.

For the surgeon who must decide between performing a subtotal hysterectomy and a panhysterectomy when removal of the uterus is necessary, acquaintance with the true incidence of cancer in the cervical stump is of vital importance. Unfortunately, this information is difficult to obtain. The follow-up of cases by surgical clinics yields a very low incidence, which is natural when it is remembered that patients may have to be traced for two or three decades. Radiological clinics, in the treatment of carcinoma of the cervix, have found a far higher

incidence of malignancy in the retained stump than have surgical clinics.

From the experience among 1,676 patients who had carcinoma of the cervix treated with radium at the Mayo Clinic from 1915 to 1930, inclusive, the condition of 108 was diagnosed as carcinoma of the cervical stump. By eliminating a few patients who were not treated at the clinic or who received treatment by cauterization only, 99 cases remain, 6.4 per cent. However, further pruning was necessary. The authors agree with Nuttall and Todd, and with Sharples, that if two years or longer have elapsed between subtotal hysterectomy and the discovery of the malignant lesion in the retained cervix, the lesion is probably a true carcinoma of the cervical stump, and not a "coincident" or dual carcinoma which was present before the operation was performed.

On this basis, 57 cases remained, or 3.4 per cent of the total series. The interval between operation and the diagnosis of malignancy was more than twenty years in 5 cases, and between ten and twenty years in 15 additional cases.

It was found, on analysis, that careful radium and roentgen therapy does yield worthwhile results, which have been improving with changes in technique. Cure for more than five years was obtained in 26.3 per cent of the cases. The patients are now living and well nineteen, seventeen, sixteen, and twelve years, respectively, after their last treatment, although the extent of the lesion on diagnosis had represented an advanced stage (80 per cent were in Stages 3 or 4) and the grade of the cancer was high in cases in which biopsies had been taken (75 per cent were Grades 3 or 4). Incidentally, patients who have never been pregnant are not immune to cancer of the cervix. In 21 per cent of cases in our series a history of non-fertility was obtained.

Results were not so fortunate in the "coincident" cases, or dual malignant lesions, those discovered less than two years after operation with carcinoma probably coexisting at the time of the operation. As Nuttall and Todd had emphasized, results in these are comparable to the results of incomplete operation for a malignant lesion anywhere in the body. Although the five-year survivals in the authors' series were only 5 per cent less (21.4 per cent), more than half of the members of the group died within the first year after treatment (54.8 per cent), contrasted with 22.8 per cent of the patients in whom true carcinoma of the stump was present. The lesions were more advanced when first seen, only 7 per cent were in Stage 2, while in the group with true carcinoma of the stump 20 per cent were in Stage 2.

Hence, although in the presence of carcinoma of the cervical stump careful irradiation can accomplish much and the prognosis is not utterly bad, much remains to be accomplished in the way of prevention. The seriousness of carcinoma of the

cervical stump must be publicized and re-emphasized. Whenever subtotal hysterectomy is performed, a conscientious examination of the cervix should be made. After such an operation, the patient should have pelvic examinations at stated intervals, and should be instructed to come voluntarily for attention at any time, if vaginal bleeding occurs.

ADnexAL AND PERIUTERINE CONDITIONS

White, M. M. The Effect of Follicular Hormone on Non-Patent Fallopian Tubes. *Brit. M. J.* 1940, 34

The author reviews briefly the studies of Clauberg on the effect of estrin on the fallopian tubes. By histological examination of sections of fallopian tubes taken from women who had undergone course of estrin therapy before being operated upon, it was shown that hyperemia and proliferation of the basal epithelium had occurred.

Experiments along these lines were carried out by the author. A total of 3 women was studied. In 2 of the 3 women, lipiodol was injected into the uterus and on x-ray examination non-patent fallopian tubes were found. In 1 of these, the x-ray diagnosis of non-patency was confirmed by insufflation with Rubin's test. In the 2 other patients who were treated, there was no injection of lipiodol before estrin therapy was started. Two of these had non-patent tubes at a pressure of 200 mm. Hg and 1 had patent tubes at a pressure of 80 mm. Hg.

Each of the 3 patients was then given five injections of 50,000 I. U. of estradiol benzoate at five-day intervals, and the insufflation was repeated. In all of these women, their investigations and the past histories gave no cause except non-patency of the fallopian tubes as a possible reason for fertility on the part of the woman.

Of the 7 patients in whom non-patency of the fallopian tubes was confirmed both by roentgenography and insufflation, 4 acquired patent tubes, 3 with good tubal contractions and with poor contractions. Three of these women became pregnant, miscarried, 2 six weeks. Patency and good contractions resulted in only 1 of the patients in whom the tubes were shown to be non-patent on insufflation only. 1 of the 4 patients in whom the tubes were patent only at high pressure and showed no contractions, the tubes became patent at lower pressure and showed good contractions, but the contractions were good in 1 instance only. The patients most likely to respond to treatment are those in whom the tubal obstruction is at the fimbriated end.

HERBERT F. THURSTON, M.D.

EXTERNAL GENITALIA

Raso, M. Congenital Cysts of the Vagina (Cisti congenita della vagina). *Arch. di anat. anat.* 1939, 3: 518

The infrequency of the occurrence of vaginal cysts is indicated by the fact that until 1933 Castagna

was able to find only 340 cases in the literature, and since then the author has added 20 more. Such makes a total of 360 cases to date. Vaginal cysts, usually single but sometimes multiple, vary in size from that of a hazel nut to that of a turkey's egg, and occur at all ages. These cysts, which usually contain blood, mucus, and serum, may be located in any part of the vagina. Their cause, in most cases, is obscure. Prognosis is always good, only in 1 case was there malignant degeneration (Falkner 1903).

The author discusses the various classifications that have been suggested, but prefers the simple classification of Polizzotti, 1) congenital (wall of vagina and müllerian ducts) acquired (traumatic and inflammatory) and mixed.

The embryonic development of the uterus and vagina and the parts from which they are derived are discussed in order to present a clearer understanding of the formation of the müllerian cysts.

Cysts originating from the müllerian duct are found with greater frequency in the fetus and newborn and represent about 4 per cent of all vaginal cysts. Müllerian cysts are located in various parts of the vagina but occur most frequently in lateral positions and are never above the fornix. The stratified epithelium is evidence of the derivation of the cyst from the müllerian duct.

The author reports a case of vaginal cyst of müllerian origin in a fetus. Only 7 such cases have been reported in the literature. The cyst, which was the size of a pea, was located at the angle between the entrance and the right fornix.

The author discusses all the theories of mechanism of formation of the cysts of the müllerian duct. Naberger believed that the formation of müllerian cysts was based on three mechanisms: isolation of the tract of the müllerian duct, deficient fusion of two müllerian ducts with permanency of the residue of one duct and postfetal detachment of vaginal epithelium. To these the author adds two more mechanisms: interfection in the primitive period of development of the deep epithelium of the vagina with successive detachment of the original surface and distention of the interfected cavity, and the possible detachment of the cyst of the vaginal gland derived from the uterus.

The author believes, after having reviewed the genesis and theories of mechanism of formation, that cysts are formed by epithelial interfection of the mucosal tract of the fornix probably in the period of development which precedes the separation of the epithelial lamina.

MICHAEL DELBERT, M.D.

Mosto, D., and Radice, J. C. Tumors of the Vagina. Benign and Malignant. *Histopathology and Discussion of 31 Primary Tumors (Tumori de vagina benigni y malignos. Histopatologia y consideraciones sobre 31 casos de tumores primarios)*. *Rev. de med. y ciencias afines* 1939, 3: 1.

Tumors of the vagina are of interest because of their relative scarcity as compared to the incidence

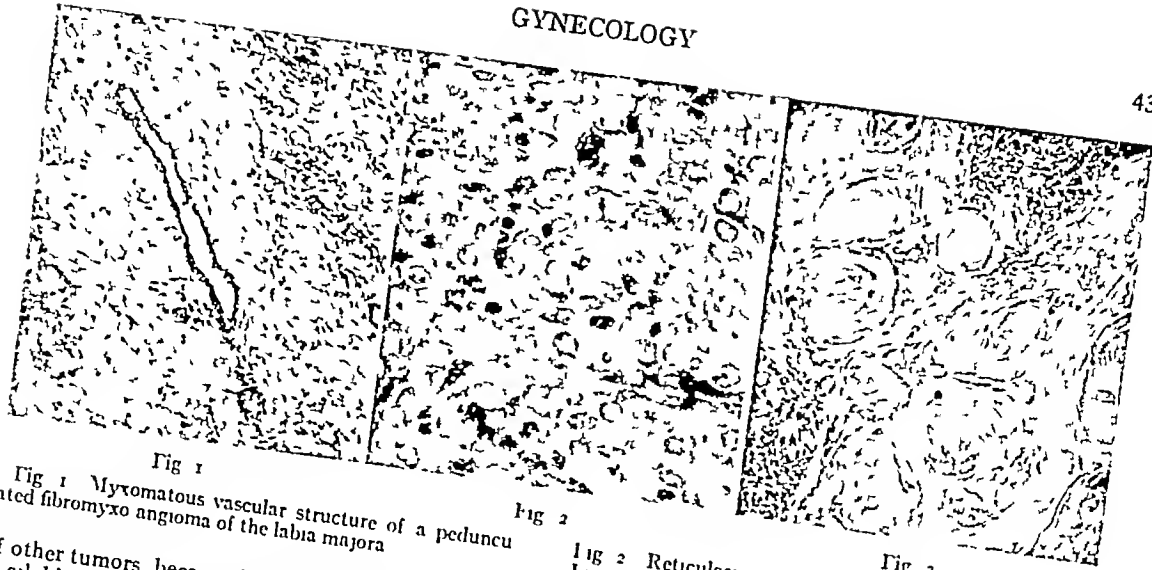


Fig 1

Fig 1 Myxomatous vascular structure of a pedunculated fibromyxo angioma of the labia majora

Fig 2

Fig 2 Reticulosarcoma of the vaginal vestibule

Fig 3

Fig 3 Spinocellular epithelioma of the clitoris

of other tumors, because histological study always is available and gives a precise knowledge of the anatomical nature of the tissue, and because their accessibility permits satisfactory treatment with a great possibility for cure. The author presents the results of his studies on 34 primary tumors of the vulva studied at the Rawson Hospital. Emphasis is placed on the histopathology. The sites of predilection of these tumors are the following, in diminishing order: labia majora, labia minora, Bartholin's glands, urethral caruncle, clitoris, and vestibular bulb. The most varied types of tumors, both benign and malignant, occur on the vulva.

The authors then present a detailed classification and tabulation of primary tumors of the vulva under the broad groups: connective tissue tumors, epithelial tumors, and complex, mixed tumors. They discuss the benign tumors and note that they are encapsulated, do not form metastases, evolve slowly, and interfere with coitus, micturition, and walking. They may be single or multiple, superficial or deep. The average age of the patients is thirty-five years, with extremes of fifty-two and five years. Microscopic ally the most common benign tumors in order of diminishing frequency are: fibromas, adenomas, papillomas, and cysts. The period of development of these tumors varied from five months to ten years. It is pointed out that certain fibro adenomas resemble certain tumors of the breast, such as juvenile fibro adenoma. Morphologically these may be derived from origin similar to that of the mammary gland. The various benign connective tissue and epithelial tumors are described in great detail with numerous references to the literature, and photomicrographs compared to the incidence of malignancy in other parts of the body. The frequency of incidence is, according to Gossel, 5.1 per cent, and according to

Matmuller, 3.2 per cent. Secondary malignancy of the vulva is most rare. In the authors' series there were 11 benign and 23 malignant tumors. These tumors occur at an advanced age and are commonly associated with pruritus and pain. The favorite locations of malignancy of the vulva in order of frequency are the labia majora, the clitoris, the vestibule, and Bartholin's glands. Leucoplakia is frequently associated with malignant tumors. The only case of glandular epithelioma probably developed from the remains of an aberrant mammary gland and looked like an adenocarcinoma. Biopsy is indicated as an important aid in establishing the diagnosis and directing the proper course of treatment.

JACOB L. KLEIN, M.D.

De Godoy, P., and Delasclo, D. Giant Papilloma of the Vulva (Papiloma gigante da vulva). *Rev obst e ginec de S Paulo*, 1939 3 347

De Godoy reports a case of giant papilloma of the vulva which was excised, and discusses vulvar papillomas in general. Clinically, the lesion is called acuminate condyloma, but anatomopathologists call it papilloma, as the clinical concept should be based on the anatomicopathological examination, the author accepts the term "papilloma".

Papilloma occurs frequently, but its cause has not yet been established. Some authors incriminate gonorrhea or any other infection which causes chronic irritation, others accuse various spirochetes, or ordinary saprophytes. Some claim that papilloma is contagious and others that it is inoculable, a filtrable virus has been accepted by Serra. Even psychic influences have been cited. A theory of trophic disturbances has been proposed as favoring the development of papilloma, while hormonal disturbances have been suggested as a factor because papillomas are frequent during the menarche and rare during childhood and after the menopause.

Papillomas occur in the vicinity of the vulva and especially on the small and large labia and may invade the vagina and the cervix. They are nearly always multiple and vary in size, their color is light pink or wine red; they are soft and humid or dry. Histologically they present connective-tissue vascular stroma and a covering of stratified pavement epithelium. They may be complicated by ulceration and hemorrhage, infection, or cancerous degeneration; the possibility of the latter is denied by some authors.

The subjective symptoms are generally discreet and determine no mental reaction in the woman, perhaps because papilloma occurs chiefly in those of low culture and poor intellect. In some cases, discharge, pain, or pruritus develops and leads to medical examination. The diagnosis is easy but a histological examination should always be made. The intradermal reaction with specific antigen and the complement deviation test have been at times by Aladerna; they were always negative. The differential diagnosis includes condyloma planum and carcinoma.

With regard to prognosis, papillomas are likely to be benign, but the possibility of cancerous degeneration must not be overlooked. The treatment consists generally of cauterization or surgery. Numerous treatments have been recommended. The physical treatments are general or local. The general treatments are intended to modify the terrain by means of magnesium salts, arsenic, autohemotherapy, intracutaneous injections of milk, and the intravenous administration of glycerin diluted with isotonic serum. The local treatments are chemical (chromic, acetic, nitric, salicylic and oxalic, or carbolic acids or silver nitrate), from perchloride, or ethyl chloride), physical (ultraviolet rays, thermocoagulation, and radium) or surgical. Psychic treatment has been recommended.

Papilloma often occurs during pregnancy which constitutes an undoubted predisposing factor. Small tumors may be cauterized, but large ones should be left alone until after delivery; however, giant ones which would interfere with delivery must be removed even at risk of abortion. RICHARD KIRBY, M.D.

MISCELLANEOUS

BROWN, O'D.: Ovarian Dysmenorrhea. Its Etiology, Diagnosis, and Treatment. *J. Obst. & Gynec. Brit Emp.* 339, 46-96.

This article was written to draw attention to the part played by the ovary in certain cases of dysmenorrhea. Most current classifications of dysmenorrhea regard the uterus as the only possible etiological factor and do not consider the rôle that may be played by the ovaries, fallopian tubes, or other structures. Dysmenorrhea of ovarian origin is a definite entity but it may often be accompanied by characteristic uterine discomfort, a fact which makes the separation of the two possible sources a matter of the greatest difficulty.

To agree that ovarian dysmenorrhea can exist either as an individual complaint or in conjunction with menstrual pain of uterine origin implies the acceptance of the view that the two structures possess their own independent and separate nerve supplies, and this is now believed to be true. Ovarian innervation is bilateral, and pain originating in one ovary may be referred to that side or to the opposite side or to both the affected and the opposite side.

It has been shown that pathways for painful ovarian stimuli exist in the ovarian nerves, as is known to be the case in the pre-sacral system in connection with the uterus, and the success of the operation of ovarian denervation for the block of painful ovarian stimuli depends upon this fact.

Only the painful or tender though apparently normal ovary is considered, the frankly diseased, adherent, and inflamed or enlarged organ, as found typically in secondary dysmenorrhea, being excluded. The grossly diseased ovary is readily recognized and accepted as a source of pain, but it is unusual in the young patient in whom the typical symptoms under discussion exist.

Sclerocystic changes assume by far the greatest importance in the cases under consideration and were present in all the cases of ovarian dysmenorrhea. The French School supports the neurogenic etiological theory and believes that sclerocystic ovarian changes are secondary to the influence of some ovarian nerve lesion rather than a primary condition. If we accept the neurogenic theory of sclerocystic ovarian degeneration with its coincident ovarian-nerve lesions, we can readily understand that only certain ovaries will be painful, and why it is that pain is an unusual symptom in the many and various sized ovarian cysts encountered. In this we also it becomes apparent how Mittlebachner's ovarian discomfort or pain may be totally absent in most women, but is often present and extensive in the minority whose ovarian nerves are abnormal. The two determining factors productive of excessive ovarian pain would, therefore, appear to be an existing nerve degeneration, and pressure upon either the ovarian intrinsic nerves or some of their fibrils near the granulosa-cell layer of follicle. Such pressure could be constant from excessive fibrosis at the proximity of nerve endings, or periodic from the edema which is present at the times of ovulation and the premenstrual phase.

Although ovarian pain is at first localized, it often becomes distributed to the superficial areas supplied by cutaneous nerves originating from the tenth thoracic segment and supplied by the genito-femoral nerve. Iliac-fossa pain on the left side is accepted as suggestive of ovarian disease of that side. Opinion generally is agreed upon the sub-umbilical localization of the pain. Winter described ovarian pain as typically "radiation to the hips and thighs on pressure over the ovaries. In brief, ovarian pain may be unilateral, bilateral, or referred to the side opposite to the lesion menstrual, but chiefly premenstrual always sub-umbilical, but chiefly on the

left side and radiating down the thighs. Although not included in the list, nausea is regarded by some as a constant symptom, while dyspareunia, dyschezia, and syncope are said often to be present.

Accurately defined midline lower abdominal pain must be regarded as uterine in origin and should not be confused with the ovarian type. Diffuse lower abdominal pain in all probability indicates dysmenorrhea of coincident uterine and ovarian origin. Ovarian pain also appears typically in two or three premenstrual days, rarely persists after the onset of the flow, and often disappears some considerable time before the bleeding begins. It can be faithfully reproduced by evoking the "deep sensibility reflex" of the ovary by pressure upon one or both ovaries during bimanual examination. Radiation down the thighs (the viscerosensory reflex) can be elicited sometimes in this way.

In contrast, uterine pain may only begin with the flow and cease after an hour or two or persist until the bleeding has completely ended. It is frequently sharp, stabbing, cramplike, or colicky in character (the so called "spasmodic" dysmenorrhea) and can be reproduced by passing a uterine sound.

Only severe cases of dysmenorrhea are considered in this communication. By a severe case the author means a patient who suffers so much pain that her work or normal activity is interrupted every month, however much she tries to make the least of the pain. After a routine general examination to exclude extragenital complaints which might upset the menstrual function, a thorough bimanual examination is carried out, with accurate ovarian palpation and the passing of a uterine sound when possible.

If a reasonable degree of bimanual compression of the ovaries, or slight displacement of them within the pelvis, produces pain similar to that experienced at menstruation, an ovarian origin for the menstrual pain may reasonably be suspected. The character and localization of the pain produced by ovarian compression is compared with that produced by passing the uterine sound. By comparing these two pains evoked by examination with the patient's account of her menstrual pain, it is usually possible to decide whether the dysmenorrhea is of uterine origin, ovarian origin, or partly due to ovarian and partly due to uterine stimulation.

Medicinal treatment has now been abandoned when severe ovarian dysmenorrhea is suspected as it has proved itself unsatisfactory in such cases. For the same reason hormonal therapy is inapplicable.

Cervical stenosis was present in only 1 or 2 per cent of the women under investigation. The author believes that cervical stenosis is rarely a cause of dysmenorrhea and that dilatation of the os is therefore illogical treatment.

Medicinal treatment of dysmenorrhea with alcohol, morphine, and other habit-forming drugs should be avoided, while the value of tonics, improved hygiene, exercises, heliotherapy, and psychotherapy are sometimes helpful. Organotherapy is only likely to be helpful in dysmenorrhea of uterine origin.

Presacral sympathectomy cannot possibly relieve pain of ovarian origin, but in the author's opinion it is efficacious treatment for dysmenorrhea of uterine origin.

In 1927 L'Hermite and Dupont suggested that the painful ovary could be rendered insensitive by denervation. These observers realized that a therapeutically successful denervation was necessarily bilateral. Their most recent technique, in brief, is the division of the two or three main ovarian-nerve bundles in the mesovarium without interference with the ovarian blood vessels.

The author's present technique for bilateral ovarian denervation consists of bilateral division of the infundibulopelvic ligaments and their nerves and blood vessels, at the brim of the pelvis through a midline lower-abdominal incision. Under general anesthesia, divided ends of each ligament are securely ligated with fine silk ligatures, and the cut ends of each ligament are sutured together on each side with two fine catgut stitches to prevent subsequent elongation of the ligament and ovarian prolapse. It is most important to divide each infundibulopelvic ligament close to its ovarian attachment, as in this way no nerve fibers will escape. It was found that interruption of the blood supply of the ovary need not be feared.

When necessary to correct a uterine misplacement a Gilliam suspension is performed, and the appendix is removed only when it is inflamed or adherent.

Results following bilateral ovarian denervation. Eighteen patients were selected as suitable for bilateral ovarian denervation. Sixteen women have been followed up satisfactorily. Ten of these regard themselves as completely cured. Of these women the only 2 who have married since their operation both have now normal healthy infants. Labor in each case was normal and ended spontaneously. We may regard the 10 patients who were completely cured by bilateral ovarian denervation as examples of true ovarian dysmenorrhea, and consequently assess its incidence as 11.9 per cent of all severe dysmenorrheas.

Ovarian dysmenorrhea often occurs in association with uterine dysmenorrhea constituting the cases the author terms "mixed dysmenorrhea." In the light of this knowledge the partial and complete failures (35 to 40 per cent) Cotte and others have experienced following presacral sympathectomy are readily understood, as is the persistence of dysmenorrhea following total hysterectomy. Polycystic ovarian changes with sclerosis were a constant finding in all the patients successfully treated. The menstrual rhythm was usually normal despite the pre-existing ovarian abnormality.

Six cases are classified as failures. Four of these showed gross pelvic lesions which were not diagnosed before operation. Incorrect diagnosis and treatment may be regarded as the explanation of these failures.

The 2 remaining failures, in which a gross pelvic lesion was not present, appear to have resulted from a wrong choice of treatment (ovarian denervation).

alone) as the degree of uterine pain was under estimated.
DANIEL G. MORROW, M.D.

Westman, A. Differential Diagnostic Problems in Virilizing Diseases of Women (*Differentialdiagnostische Probleme bei virilisierenden Erkrankungen der Frau*). *Acta obst. et gynec. Scand.*, 1930, 9: 455.

Westman discusses some differential diagnostic problems with reference to 3 cases.

The first case was that of a woman aged thirty-seven with the typical features of Cushing's disease. She had a full-moon face marked diplosy of the trunk, slender extremities, striae, marked growth of hair on the upper lip and chin, reduction of the mammary glandular substance, psychically marked dullness and blood pressure 170/100. She had had multiple rib fractures, which were healing with callus. Exploration of each adrenal gland revealed no abnormality. Roentgenographic study of the skull showed no hypophyseal changes, but spotty reduction of the bone shadow. Treatment consisted of irradiation of the hypophysis, and was followed by some improvement. The author discusses the various theories on the cause of Cushing's disease, and mentions that some authors disagree with Cushing as to the importance of the basophilic adenoma. Biopsy in the author's case, however, did not support the assumption of the adrenal disturbances as the cause of the syndrome, and the fairly good result of the irradiation of the hypophysis pointed to this gland as governing the condition.

In the second case a woman of twenty-six years developed similar changes to those in the first case except for the striae and the osteoporosis which were missing. After estrone treatments had not helped her the author investigated the condition of the adrenal glands by biopsy. The left one was found to be normal, while the right had been transformed into a tumor of about 8 by 9 by 5 cm. which partly embraced the vena cava. This tumor was removed. After a few hours the blood pressure fell alarmingly and in spite of intravenous drip cortisone, ephedrine and cardiac stimulation, the patient died about twenty-four hours after operation apparently from adrenal insufficiency. Post-mortem examination was essentially negative. Histologically the tumor was diagnosed as cortical adrenal adenoma of benign character. As the left adrenal gland was almost normal histologically Westman explains the fatal adrenal insufficiency by assuming that the apparently normal left gland was in state of hypofunction because of the large tumor of the other gland. When this was removed, the presumably healthy gland on the left side failed to substitute. The hypophysis was found to be entirely normal, and also the bromination of the basophilic cells, typical for Cushing disease according to Crooke, was absent.

The third case was that of a girl of sixteen who had never menstruated except for one day when she was thirteen. She had deep bass voice, virile type of hair distribution, very small breasts, and marked

beard on the chin and cheeks. The clitoris was enlarged, the testes very small, and there was a resistance behind it of the size of an orange. Hormone estimation and roentgenograms of the sella region were normal. The diagnosis of a virilizing ovarian tumor was made and affirmed on operation. Oophorectomy and salpingectomy were done on the left side. The tumor weighed 70 gm., and its dimensions were 8 by 6 by 4 cm. Histologically it resembled an arrhenoblastoma. After operation some of the masculine features (amenorrhea, underdeveloped breast, beard) disappeared, while others (voice, hypertrophied clitoris, hair distribution) persisted. As the left adrenal gland had been found enlarged on operation the author believes that there is still persistent virilizing influence originating from this gland.

The differential diagnosis in cases of virilism in women is easy if there is palpable ovarian tumor. As, however, even very small ovarian tumors, as detectable by bimanual palpation, may be responsible an exploratory laparotomy often has to be done. This enables the surgeon to palpate the adrenals, and is a method which the author prefers to roentgenography following insufflation with air.

HENRIK LARSSON.

Tornerus, A. External Endometriosis (*Uterus der Krankheit der Endometriosis Externa*). *Acta obst. et gynec. Scand.*, 1930, 9: 477.

This writer presents a well organized manner careful study of 300 cases of endometriosis. All of the cases were followed-up for at least one year. Based on the observation of 105 cases, each one operated upon, the lesions are classified into three groups: endometriosis of the serosa of the pelvic endometriosis of the retrocervical region, and endometriosis of the retro-uterine region. Endometriosis of the ovary often developed in all three groups. In the last three groups extraperitoneal foci developed in the rectum, other parts of the bowel, in the dorsal part of the vaginal vault in the labia and in the inguinal canal. In early cases the lesion was most commonly localized on the serous surface of the fovea of Douglas. As secondary diseases (terine fibroids, ovarian tumors, portio carcinoma and tubal pregnancy) were observed.

The disease was observed more commonly in women between the ages of thirty and forty years, although cases as observed in the age of fifteen and patients over fifty years of age. One hundred and forty of the patients were married. The author calls attention to the observation that most of his patients were of an albino type, with genital infantilism. Most of them lived in cities and gave history of not having done physical labor.

Dysmenorrhea was the most common symptom. It occurred in 7 per cent of this series and had been present since the menarche in 40 per cent of the patients. Symptoms of peritoneal irritation were observed in 44.5 per cent. Forty-six per cent of the patients had rectal symptoms and 7 per cent had

symptoms referable to the urinary bladder. Menorrhagia and metrorrhagia occurred only in advanced cases and were most frequently evoked by secondary diseases. Twenty-eight per cent of the patients had a comparative gonorrhoea in the early stage; 95 per cent of the married women had either a primary or secondary sterility.

Twenty-two per cent of the patients were treated with a radical operation; 78 per cent were treated with a conservative operation, and the possibility of conception was preserved in 65 per cent. Manifest recurrence developed in 6 patients and latent recurrence in 3 patients who had conservative operation. Of the previously sterile married women 37 per cent conceived after the operation.

EDWIN W. RAY, M.D.

Payne, I. I.: The Clinical Aspects of Pelvic Endometriosis. *Am. J. Obst. & Gyn.* 1: 30-39, 1921

Pelvic endometriosis is characterized by the potential multiplicity of its sites of invasion. The majority of the lesions occur in the ovaries and the cul-de-sac

but any of the pelvic structure or the contiguous viscera may be affected.

It is a disease of middle and late menstrual life, with an incidence of approximately 50 per cent between the fourth and sixth decades. Additional pelvic pathology accompanying endometriosis in four-fifths of the case, to obscure its presence and to cloud the diagnostic picture. The chief symptoms of endometriosis are those of local pain, alterations in the menstrual and reproductive process, and dysfunction of the contiguous organs. The treatment which may be that of routine observation, surgical intervention or irradiation, depends upon the severity of the symptoms, the patient's age, and the removability of the major lesions.

Conservation particularly in young patients with preservation of ovarian and, if possible, menstrual and procreative function is justified by the results: complete or partial relief of symptoms in from 95 to 99 per cent of the cases, need of further treatment in 8 per cent, and subsequent pregnancy in 9 per cent.

EDWARD L. COLEMAN, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Maisoux, N. P., and Mladgi I.: Ante-Partum Hemorrhage. *J. Obst. & G.*, sec. Brit. Emp. 1930, 46-64.

This article starts with a historical review and the treatment of placenta previa as practised from eighty to a hundred years ago is summed up as follows:

If bleeding occurred before delivery the obstetrician was advised to ascertain whether the placenta presented over the os uteri and, if so, whether the os was wholly or partly covered by it. If the placenta was found to be entirely covering the mouth of the uterus and the cervix was dilated to the size of half-crown, version was performed. If partial placenta previa the membranes were punctured. If hemorrhage did not cease, the child was turned. In patients in whom the os was found rigid, and the bleeding alarming and not to be restrained by these methods, the vagina was plugged with silk or cambric handkerchief or lint steeped in oil, vinegar or weak solution of alum.

In the old literature dealing with the treatment of ante-partum hemorrhage, there are several points of outstanding importance, the value of which is as great today as it was when they were first given, hundred years ago. The value of giving blood transfusions before proceeding with the operation if the patient is in poor condition is stressed. The danger of vaginal examinations is emphasized, it being thought that such examinations might initiate serious hemorrhage. A warning against constipation and violent purging is given for the same reason. Rapid extraction after version is interdicted lest the uterus will not contract well after delivery.

The subsequent history of placenta previa brings into prominence four other methods of treatment which, together with rupture of the membranes and application of binder have become established in modern times.

Barnes' hydrostatic dilators. Barnes' method as described by him, consisted in dilating the cervix by hydrostatic dilators. These were special bags which he introduced inside the cervix after separating the placenta from the wall of the uterus by sweeping the finger around in circles.

Briggs' down foot. This consists in turning the child by the foot by the method in an early stage of labor and after rupture of the membranes bringing down the foot so that the buttocks of the fetus will press against the placenta. The bleeding sinuses should be tamponed. Either delivery was left to Nature.

Cesarean section. The failure of vaginal methods in many cases naturally paved the way to the adoption of abdominal section to meet a condition of undoubted gravity. Despite the theoretical opposition from conservative obstetricians, the method has

steadily gained in popularity and has spread all over the world. MacKenzie's study of 25 cases collected from all over the world indicates the superiority of this method.

Willet's forceps. In 1925 J. A. Willett, of London, devised a special forceps for application to the scalp of the fetus, to which weight traction is applied. The compression of the placental site by the head, thus applied, helps to stop bleeding and assists in dilating the cervix.

RESULTS OF TREATMENT IN PLACENTA PREVIA

In the maternity service of the Kasr El Aini Hospital during the last ten years there were 314 cases of placenta previa among 8,467 deliveries, an incidence of 3.7 per cent. About 6 per cent probably represent the true incidence.

The placenta was lateral in 63 patients, marginal in 184 and central in 6 or 53.7 and 19.7 per cent, respectively. Thirty-four patients (10.8 per cent) were primiparas, and 280 (89.2 per cent) are multiparas. The average parity was five and the average age was thirty-two.

Four patients (1.3 per cent) of the group of 314 were pregnant between twenty-four and twenty-eight weeks, 63 (20.1 per cent) between twenty-eight and thirty-two weeks, 33 (10.5 per cent) between thirty-two and thirty-six weeks, 93 (29.6 per cent) between thirty-six and forty weeks, and 6 (1.9 per cent) had hemorrhage at term.

The methods of treatment employed are rupture of the membranes and application of binder in mild or moderate cases with good palms (46 cases). Dobbin's application of forceps to the scalp in moderate cases with cephalic presentation (78 cases) and bringing down a foot in similar cases with breech presentation, or Braxton Hicks' method in the more severe cases in which more positive pressure was required (65 cases).

Cesarean section was reserved for those cases in which the pregnancy was at or near term, especially when such cases presented themselves with an undilated os and were considered to be free from the chance of infection. Only 10 cases were treated by this method.

Of the 314 patients, 9 died, gross maternal mortality of 2.9 per cent. Of the children, 54 are still-born, mortality of 17.2 per cent. Premature

the chief cause of fetal mortality. It is realized that 46 cases of placenta previa, which occurred among 31,463 deliveries, 14 of these 46 cases required section as performed, with a mortality of 3.3 per cent, in contrast with a mortality of 5.6 per cent among the cases treated by vaginal methods. The fetal mortality was 30 per cent among the cesarean group and 40 per cent among the vaginal group. Binder reports 34 cases among 9,000 consecutive deliveries. The gross mortality was only 4 per

cent The fetal mortality was 60 per cent Thompson reports a series of cases in which the mortality of cesarean section was 6 per cent, while 36 patients treated by the insertion of the hydrostatic bag all recovered Greenhill reports 118 cases of which 42 were treated by abdominal section with no mortality, and 76 by vaginal methods with 4 per cent mortality Wilson gives a series of 102 cases, of which 32 were treated by cesarean section with no mortality, while 70 treated vaginally had a mortality of 4.3 per cent

Daily, of the Chicago Lying in Hospital, reports a series of 130 consecutive cases (1927 to 1934) with no maternal mortality, and with a fetal mortality of 22 per cent

Cesarean section by the lower uterine segment technique is the treatment usually favored, and accounts for 58 cases of the series Of the remaining 81 cases, 25 were treated by rupture of the membranes, 18 by bipolar version, 12 by insertion of the hydrostatic bag, and 6 by Porro's operation

Of the 4,580 cases analyzed by Berkeley, 1,911 were treated by one of the five principal methods now practiced Of these 1,911 cases 502 were treated by cesarean section, with 21 deaths, 571 by bipolar version, with 30 deaths, 391 with scalp traction, with 4 deaths, and 391 by rupture of the membranes, with 5 deaths Fifty six cases were treated by insertion of the hydrostatic bag Berkeley is in favor of the use of a single method of treatment as against what he calls composite methods Cesarean section is advocated as the safest method of delivery in placenta previa for both mother and child, especially in patients with thirty-six weeks of pregnancy or over The gross maternal mortality of this method is about 4 per cent, and the fetal mortality is around 15 per cent, the maternal mortality of bipolar version is nearly 7 per cent, but the fetal mortality is 85 per cent

Berkeley gives the following points to be observed in the treatment of patients with placenta previa

- 1 Control the bleeding as soon as possible
- 2 Do not make a vaginal examination unless prepared to embark at once on an appropriate treatment
- 3 Combat the shock, if such is present
- 4 Take every precaution to prevent septic infection
- 5 Do not hasten delivery, except in cases of cesarean section
- 6 Perforate the placenta, if necessary, with a sharp pointed instrument
- 7 Whenever possible the patient should be treated in a hospital or first class nursing home, with expert assistance

ACCIDENTAL HEMORRHAGE

In the maternity service of the Kasr El Ain Hospital there were 83 cases of accidental hemorrhage among 18,467 deliveries during the last ten years, an incidence of 0.44 per cent Of this group of 83 patients 12 were primiparas and 71 were multiparas, a percentage of 14.4 and 85.6, respectively In 14

cases, or 16.8 per cent, the hemorrhage was of the concealed type

Of the 83 patients 16 died, a mortality of 19.2 per cent Of the children, 51 of the 84 were stillborn, 1 patient having twins, a mortality of 60.7 per cent Most of the mortality occurred among those with the concealed type of hemorrhage

The average age in the whole group was thirty years, and the average parity was 4

THE ETIOLOGY OF ACCIDENTAL HEMORRHAGE

In spite of extensive work on the subject, the primary cause of separation of the normally implanted placenta remains obscure Trauma is one cause in the author's series of 83 cases trauma appeared to be a factor in 5 Trauma, of course, may simply be the exciting factor in a patient on the verge of bleeding

The association of pre-eclamptic toxemia and eclampsia with placental, retroplacental, and myometrial hemorrhage has been noted by many authors Albuminuria was present in a large proportion of the author's patients, amounting to 86.7 per cent, and was associated with other signs of toxemia

It may also be difficult to say whether the toxemia is the cause or the result of the hemorrhage Thrombosis of the ovarian vein has been suggested as a possible cause

The renal function is impaired in many cases but returns to normal some months after delivery, which shows that true chronic nephritis is not present The hypertension observed in some cases is not necessarily from nephritis, but may be due to toxemia

Bartholomew and Kracke favor the theory of placental infarction in the explanation of the etiology of pregnancy toxemia and placental separation There is insufficient histological or clinical evidence to support this view

Couvelaire, Essen Moller, and others described characteristic lesions in the uterine wall which serve to explain the failure of the organ to contract but still leave us in the dark as to the primary cause of these lesions

Multiparity is said to be a strong predisposing factor Only 19.2 per cent of the cases collected by Holmes were those of primiparas In Williams's group 30 per cent of the patients, and in the authors' group 14.4 per cent, had accidental hemorrhage in their first pregnancy

Sudden emptying of the uterus, especially in hydramnios and twin pregnancy, severe torsion of the organ, and traction on a short umbilical cord have all been blamed, on mechanical grounds, for accidental hemorrhage

German writers suggested chronic endometritis as the cause, and brought multiparity forward as a strong argument in favor of their view Modern conception renders this theory hardly tenable

Heim found an excess of Prolans A and B in the urine of the toxemic type of patients, and Shute found excess of estrogenic substance in the blood, suggesting an endocrine factor

Avitaminosis particularly deficiency of Vitamins E and C and even allergy were suggested to be causative factors.

THE DIFFERENTIAL DIAGNOSIS OF ANTE PARTUM HEMORRHAGE

In cases in which the cervix is dilated the differential diagnosis between accidental hemorrhage and lateral placenta previa is always difficult.

Earlier writers laid stress on the recurrent nature of the bleeding and its entirely painless character in placenta previa and on the pain, distress, and sense of tightness in accidental hemorrhage.

Although albuminuria and hypertension are not invariably present in accidental hemorrhage and may be present in association with placenta previa, they still have a place in the diagnostic assessment of difficult cases of a te-partum hemorrhage.

The demand for early diagnosis in the attempt to reduce the maternal and fetal mortality of such a grave complication of pregnancy has led to the introduction of various aids to clinical methods of diagnosis.

Sheth considers that in all cases of accidental hemorrhage there is excess of estrogenic balance in the blood and a hormone-vitamin imbalance which can be detected by testing the serum of the patient.

The injection of strontium iodide or Luesolectan B into the amniotic sac through the abdominal wall makes it possible to outline the placenta clearly in a ray film. The great risk of this method, however, is the liability to bring on premature labor.

Snow, Miller, and Powell showed that it is possible to demonstrate the placenta even in an ordinary ray film, but the reading of such films is difficult. Cude, Walter, and Lerner have shown that it is possible to diagnose placenta previa by taking a ray film after the injection of sodium iodide solution into the bladder.

The value of these tests remains to be proved by further research. However the difficulties in making correct diagnosis in some cases of te-partum placental separation are still so great that in some cases correct diagnosis can be made only by careful examination of the placenta after delivery.

D. M. G. MORRIS, M.D.

Ince, J. G. H. On the Value of Cephalometry I: The Estimation of Fetal Weight Based on Measurements of 1000 Infants. *J. Obst. & Gynec. Brit. Emp.* 1950, 46: 603.

With the increasing use of the ray in obstetrical practice attention has been directed to the value of intra-uterine cephalometry in the attempt to determine the maturity and the weight of the fetus. The series of cases discussed consists of 10 babies delivered at University College Hospital during 1935. All the babies were eighth birth, and the biparietal and occipitofrontal diameters were measured on the fourth day. This day was chosen in order to allow molding to disappear.

The relation between the biparietal diameter and the birth-weight was worked out, and the equation

$$W = 4.6 \times B - 9.79$$

in which W is the weight in pounds, and B is the biparietal diameter in inches was formulated. The biparietal diameter is of little value in determining the real weight of a given fetus before birth. It may be used, however, to form a rough estimate of the probable weight.

The biparietal measurement in this series varied from 3.9 to 4.05 in. in terms. The variation is too great to allow accurate estimation of maturity in any given fetus. The relation between the biparietal and the occipitofrontal diameters has been worked out in this series and, while there is a definite relation between the two measurements the range of variation is too great to allow accurate prediction in any given case.

From the observation made on this series of cases the following equation was formulated to calculate the birth-weight from the occipitofrontal diameter

$$W = 3.95 \times O - 1.13$$

in which W is the weight in pounds and O is the occipitofrontal diameter in inches. This equation gives a correlation coefficient of 0.677 ± 0.17. The standard error of prediction is 1.55 oz.

The range of values found for any given measurement of the occipitofrontal diameter is here too great to allow an accurate estimate of the weight in any given case. Thus these measurements are only a rough guide to the average weight and maturity. The maternal weight to be expected from a given measurement is about 1 lb. below the estimated weight, but as the series contains only 13 observations below under 5 lb. 11 eight lb. cannot be relied on to give the actual minimal weight.

D. M. G. MORRIS, M.D.

LABOR AND ITS COMPLICATIONS

Kepp, R. K. The Therapeutic Use of Follicle Hormone in Prolonged Pregnancy and in Primary Inertia (Über die therapeutische Anwendung des Follikelhormons bei Übertragung und bei primärer Wehenlosigkeit). *Geburtsh. f. deutsch. 1950*, 650.

This article is a detailed consideration of the importance to the present time on the significance of follicle hormone and other factors in the onset and conduct of labor. In the Universitäts-Frauenklinik in Goettingen follicle hormone was used therapeutically for one year for the induction of labor in prolonged pregnancy and in the management of primary inertia. A trial was first made of course of quinine and pituitrin. If this failed it was repeated in a few days and supported with follicle hormone. Prognosis B of fort (50,000 international benzoin unit of estradiol benzoin) in total dose of from 50,000 to 200,000 international benzoin unit was used later also estradiol (dihydro-follicle hormone) was admin-

istered intravenously in doses of from 5 to 10 mgm. Of 56 cases of probable (not definitely proved) prolonged pregnancy, 27 responded to the first course. In 10 of the remaining 29 patients, it was possible, after further courses with the addition of follicle hormone inserted at various times, to bring about a labor leading to delivery. In 4 of the 10 children the prolonged pregnancy could be definitely established. In 2 cases of intra-uterine death of the child before the onset of labor progynon was given with the first course. In the case of the prolonged pregnancy this combined course was successful, in the second case (a seven months' pregnancy) it was not. One induction of labor by means of progynon at the calculated time of term failed. The result was more definite in cases of true primary inertia. In 15 of 18 instances a definite improvement of the labor contractions was observed about one-half hour after from 50,000 to 100,000 international benzoate units were administered, the uterus which had previously been almost refractory to quinine and pituitrin responded better to their immediate renewed administration. Injuries to the mother and the child were not observed.

(HERRNBERGER) RICHARD WARREN, M D

Waters, E G. Supravescical Extraperitoneal Cesarean Section. *Am J Obst & Gynec*, 1940, 39, 423

Thirty-two patients have been operated upon by the technique described by the author. Twenty-four were primiparas and 6 were multiparas. Of the latter, 3 had previous cesarean sections. There were no maternal deaths and 1 fetal death among the 32 cases.

The operating time for the entire group ranged from twenty-nine to eighty-two minutes and averaged fifty-four minutes. The average stay in the hospital was eighteen days, although half of the patients were discharged within fourteen days after the operation.

The bladder peritoneum is extremely adherent to the perivesical fascia but both as a unit are separable from the bladder. It is then possible to identify the perivesical and periuterine portions of the fascia endopelvina, and by incising them in given manners and planes, permit adequate separation of the bladder from the uterus. Once accomplished, these two maneuvers should permit the bladder to be dropped down and forward from the lower uterine segment, and the separated supravescical peritoneum with attached fascia and the periuterine fascia and peritoneum to be held upward, a large exposure of the lower uterine segment being obtained in this fashion.

In actual dissection of the bladder peritoneum, the subperitoneal tissue is carried away with it, its vitality being thereby conserved and its postoperative reattachment facilitated. If the uterus now be incised transversely, in a crescentic manner with apex downward, several effects are obtained. The curved incision, acting as the "diameter for the circular birth opening in the uterus," is more effective than a straight line between its terminal points could possibly be, for the longer line or diameter

allows a larger "birth circle" in the elastic uterus. The technique is fully described.

EDWARD L. CORNELL, M D

PUERPERIUM AND ITS COMPLICATIONS

Rosenthal, A H, and Stone, F M. Puerperal Infection. *J Am Med Ass*, 1940, 114, 840

Two cases of vegetative endocarditis due to the hemolytic streptococcus, Groups B and C, were observed, one was postabortal and the other probably post-partum. Death occurred in both cases. The death due to the Group C streptococcus is believed to be the first of its kind reported. Massive sulfanilamide therapy failed in both cases, although the retention of infected placental tissue may have been a contributory factor in 1 case.

In vitro and *in vivo* experiments were carried out to determine the effect of sulfanilamide on the particular strains of streptococci found in these 2 cases. The results indicated little or no chemotherapeutic effect.

CHARLES BARON, M D

NEWBORN

Clifford, S H. Asphyxia of the Fetus and the Newborn Infant. *Am J Obst & Gynec*, 1940, 39, 388

Intra-uterine asphyxia produces fetal damage proportional to the degree and duration of the anoxemia and to the susceptibility of the individual fetus.

A hypothetical explanation of the physiology of asphyxial injury is presented. As the result of asphyxia every organ and tissue of the fetus is subjected to a varying degree of vascular congestion, with further continuation of the asphyxia, every organ and tissue may develop a varying degree of edema, hemorrhage, and cell injury. The resulting clinical manifestations are dependent on the degree and extent of the underlying pathological changes.

The prevention of fetal asphyxia demands methods of obstetrical anesthesia and analgesia that do not produce fetal anoxemia or injure the fetal respiratory center.

The practice of holding the head back and abnormally prolonging the second stage of labor may produce a dangerous degree of fetal asphyxia and should be abolished. Efforts should be made to shorten the second stage when conditions are favorable.

A varying amount of fetal anoxemia is an unavoidable part of certain complications of pregnancy. The ideal method of obstetrical management under these conditions represents individual treatment of each complication. In general, a method of treatment should be sought that will minimize the degree and duration of the intra-uterine asphyxia, yet at the same time safeguard the mother's welfare. In the case of intra-uterine asphyxia resulting from placenta previa a plan of treatment beneficial to both mother and child has been developed.

GENITO URINARY SURGERY

ADRENAL, KIDNEY AND URETER

Beltramo, V.: Experimental Studies on the Pathological Anatomy and Function of the Kidney. Exposed to Temporary Ischemia (Contribut. all' studio anatomico-patologico funzionale del rene sottoposto ad ischemia temporanea. Ricerche sperimentali). *Arch. ital. di urol.* 939, 6: 435

The author first reviews the literature, and after a detailed report on the work of numerous others in this field notes that there have been comparatively few studies of renal function after temporary ischemia of the kidney. Ferrarini and Fulle reported transitory albuminuria. Hubner noted increases in the residual nitrogen and retention of water.

The author conducted a series of experiments on rabbits and dogs in which he temporarily interrupted the renal circulation with ligation or forceps for one and one-half and two hours. The renal function was studied in each instance and histological studies were carried out on the kidneys. Detailed tabulations of the structural and functional results in each animal are presented as well as photomicrographs and roentgenographs.

The following conclusions were drawn:

With a two-hour ischemia in rabbits there was noted sclerosis of the renal parenchyma and epithelial degeneration, most extensive in the renal cortex. Deposits of calcium salts sufficient to show up in the x-ray film were also observed. In some of the kidneys from this group the structural changes were mild and the glomeruli and vessels were not involved. In dogs after two-hour ischemia of the kidney, foci of sclerosis and epithelial degeneration were observed in the renal cortex alternating with apparently normal areas. With a one and one-half hour ischemia the lesions in the kidney are more circumscribed and less serious, with predominance of normal renal tissue. With only one-hour ischemia no noteworthy lesions were observed in the kidney. The author's findings agree with those of Litten, Israel, Werra, and Jatta, who found serious renal lesions only after two hours of ischemia. The function of the kidney was found to be well preserved after two hours of ischemia. The author found that in 50 per cent of the rabbits and in 3 of 4 dogs the renal function was normal according to intravenous pyelography. A mild and temporary albuminuria was noted in some instances. There was no difference noted in the renal reactions of dogs or rabbits to the ischemia, except for more abundant precipitation of calcium salts in the rabbit. JACOB E. KATZ, M.D.

Oppenheimer, G. D.: Evaluation of Roentgenography of the Surgically Exposed Kidney in the Treatment of Renal Calculi. *J. Urol.*, 1940, 43: 53.

The incidence of recurrence after conservative operation for renal calculi varies between 4.6 and 60

per cent in various clinics, because of such factors as differences in the follow-up time, accuracy of the observations, and the type of cases treated.

Of 4 cases of calculous disease of the upper urinary tract observed at St. Sinai Hospital, New York City between the years 1918 and 1933, 35 per cent were followed up for an average period of four years. Twelve and one-tenth per cent of the patients were nephrectomized, 40 per cent underwent conservative renal surgery and 7.5 per cent ureteral ligation. Conservation of the renal tissue was the guiding consideration. Of 30 patients operated upon for unilateral calculous disease, 4.6 per cent had subsequent calculus formation on the opposite side after the original observation of unilateral disease. The operative results in 141 cases of all types—aseptic, infected, unilateral, bilateral, primary and secondary stones—showed that the true recurrence rates for pyelolithotomy, pyelonephrolithotomy, nephrolithotomy and the total rate for all the operations were 14.9, 3.29, 4 and 1.1 per cent respectively. The residual recurrence rates were 0.6, 3.2, 4.4, and 7 per cent, respectively, and the totals of the true recurrence and residual recurrence rates were 15.5, 5.4, 5.6, and 30 per cent, respectively. The presence of residual calculi, or their absence, was determined by routine control renal roentgenography at the time of the patient's discharge from the hospital. The total incidence of recurrence after operation would be materially reduced if the problem of residual recurrence were completely solved. In the meantime, the frequency of true recurrence may possibly be reduced by the control of infection (with the newer chemotherapy (sulfanilamide, arsanilamide, mandelic acid), high sodium diets, or by resection of persistent infected and deformed portions of calculous kidneys).

The use of kidney ray control at the time of operation to help find stones which are impalpable or which have been overlooked is less care of the residual-calculus situation. The technique follows:

All the stones or fragments that can be located are removed from the kidney pelvis and calyces. The previously mobilized kidney has necktie packing placed around it in sling fashion for traction. A Black kidney film, measuring 34 by 34 in., which is released on one side by tin foil and on the other side by black paper is placed in a thin sterile rubber bag. The bag with the black paper side forward is placed deeply into the wound against the posterior aspect of the kidney; the latter being raised by the gauze sling. Three or more needles are then inserted into the lower border of the kidney as markers. For purposes of identification the one at the lower pole has its eye down as contrasted with the points of the other needles. All retractors and artery clamps are removed using Waste-Barkett shockproof bedside ray unit, with a 5 in. gap, 3 mm. and with

the tube at about a distance of 36 in from the film, an exposure of about 3 seconds is made. The bag with the film is then removed and the developed film is shown to the surgeon in about four minutes. Any remaining stones or fragments shown on the film are then removed. If the kidney cannot be mobilized, a large film may be placed behind the kidney and the general kidney region exposed to the x-rays. The outline of the kidney is indicated by means of a bent probe placed around the periphery for this purpose. The real advantage of the control x-ray procedure was demonstrated by the fact that stones were found and removed from 15 of 33 patients in whom stones or fragments were not palpable or found without roentgenograms.

During the last five years, 52 patients were subjected to x-ray control while being treated surgically for multiple or dendritic calculi. The total for the ten-year period was 85 of such examinations. In 29 patients, stones or fragments which were impalpable, or found without the aid of roentgenograms, were located by x-rays and removed. In 17 patients stones were seen but could not be removed, in some cases because of the patient's general condition. In other cases only some of the stones or fragments could be removed. In 55 of a total of 63 cases in which the x-ray control indicated the absence of residual concretions, this indication proved to be correct. In 2 patients calcific shadows were seen but there were no calculi. In several patients the operative x-ray control was negative, but small concretions were removed in spite of the negative finding on the film. In cases of movable calculi, this technique is also of value in finding a small stone, especially one that cannot be palpated. In secondary operations, or in cases of patients with a small extrarenal pelvis, roentgenography may be helpful and particularly useful in preventing much trauma incident to extensive exploration for an elusive stone. Localization is also valuable in finding a stone hidden in a calyx in the presence of hydronephrosis, or behind a strictured neck of a calyx.

LOUIS NEUWELT, M D

Podio, G. The Value of Roentgen Therapy for the Suppression of the Function of the Kidney in Ureteral Lesions (Sul valore del trattamento roentgenoterapico per la soppressione della funzione del rene in casi di lesioni ureterali) *Riv ital di ginec*, 1939, 23 77

A patient was presented with a ureteral fistula which had developed following complete hysterectomy. In accordance with the proposal of Klein, the author tried to suppress the function of the kidney on that side by roentgen irradiation. After an unsuccessful trial of six months' duration, a nephrectomy was done, with removal of a large pyonephrotic kidney. A careful study of the literature on this procedure was then made.

It is believed that many factors may influence the result. Among them are age, obesity, the original gynecological malady, the time elapsing between

the operation and the appearance of the fistula and the beginning of the irradiation, and the condition of the urinary system before operation. One should keep in mind the action of the rays, not only upon the kidney but also upon the fistula proper and the surrounding tissues. During the treatment, careful periodic examinations of the urinary system should be made in order to anticipate any complications. These examinations are also of value in determining the exact mechanism responsible for cessation of leakage through the fistula, if it should occur. This cessation may be associated with closure of the fistula with patency of the ureter and conservation of renal function, with blockage of the ureteral stump and consequent atrophy of the renal parenchyma, or with true cessation of renal function secondary to irradiation.

When the condition of the patient and the technical difficulties preclude operation for the fistula, the method of Klein should be tried. This set of circumstances is apt to occur particularly following the Wertheim operation. FRANK McDOWELL, M D

BLADDER, URETHRA, AND PENIS

Di Giacomo, A., and Berti Riboli, E. Enlargement of the Bladder Capacity by Means of an Intestinal Loop (Contributo allo studio dell'ampliamento della vescica con ansa intestinale) *Arch ital di urol*, 1939, 16 406

The urologist has occasion to treat patients whose bladders have lost their normal capacity and when a few cubic centimeters of urine are expelled they experience much pain and tenesmus. This condition may be due to chronic inflammation or ulceration of the bladder with resultant hyperexcitability of the musculature of the bladder. Careful differentiation should be made between functional and organic disturbance of the bladder function. With chronic inflammation all the structures of the bladder wall may be involved and lead to scar formation and shrinkage. The most common causes of diminished bladder capacity are ulcers of the mucosa, embolus, thrombosis, and spastic contraction of the capillaries, which lead to disturbance of nutrition of the mucosa with resultant ulcer formation. In such cases there is frequently an associated reflux into the ureter and renal pelvis. Cystoscopy reveals an atrophic, yellowish, pale mucosa, avascular and, at times, scar formations may be noted. The treatment for this condition is a vesico enteral plastic operation.

The success of such a procedure depends on three factors: the choice of the proper indications and time for intervention, a precise knowledge of the mechanism of the function of the bladder, and a knowledge of the operative technique involved. Before intervention it is necessary to reduce the local inflammation and the condition of the urine by proper local medication of the bladder. The author then discusses in detail the physiology of the bladder and points out that the fundus of the bladder is very mobile and is always in contact with intestinal loops.

The literature on the operative technique is reviewed from 1899 to 1939. The authors note the possibilities of such complications as ascending pyelonephritis. They believe that there is least danger of ascending infection when a loop of small intestine is used for the plastic operation. They describe and illustrate by *drawings* the various types of operations suggested by Scheele, R. Williams, Strassmann and Birnbaum. After a loop of small intestine has been isolated for this purpose the mucosa is washed with oxyzanat of mercury 1:1000 to avoid the possibility of infection. This mucosa after implantation becomes atrophic; there is no absorption of urinary excretion products from the intestinal mucosa.

The authors review the literature, the experimental operative technique and note that animal experimentation in this field was first performed by Tissoni and Foggi of Bologna in 1888. The authors' personal experiments were done on a series of female dogs under general anesthesia. After the bladder had been washed off by sponges from the general peritoneal cavity a loop of small intestine was isolated, while the rest of the intestine was reanastomosed by lateral anastomosis. The new plastic wall was attached by silk sutures to the fundus of the bladder, which the author considers the most favorable site for the new addition to the bladder wall. The dogs were kept on a liquid diet for ten days after surgery. Bloody urine was emitted for the first twenty-four hours after operation. Of the animals operated upon, one died of peritonitis on the third day after operation, another dog died on the fifth day after surgery from an ascending pyelonephritis. The authors present detailed protocols of the dogs which were operated upon and x-ray studies of the completed bladder.

The authors conclude that anastomosis of the bladder with the intestine for the purpose of increasing the capacity of the former leads to successful anatomical and functional results. The success in dogs leads to the conclusion that this same technique may be successfully used in man, although the procedure in man would be more difficult because it is not easy to exteriorize the bladder in man. The authors found that the transverse position of the plastic loop of small intestine when attached to the bladder fundus is the most practical.

JACOB E. KIRK, M.D.

Gold, L. S., and Hoffman, E. F. A New Approach to the Treatment of Certain Bladder Carcinomas. *Radiology* 450, 34, 205.

A summary of the indications and methods for the treatment of carcinoma of the bladder are reviewed by the authors. It is their opinion that since 75 per cent of all tumors of the bladder involve either the trigone or the neck of this organ, or both, and large percentage are either so far advanced or so extensively infiltrated when they are first seen, they do not lend themselves well to modern procedures. For this group of tumors, or selected instances in this group

the authors propose manipulation of the bladder and intense radiation *in situ* by the contact therapy method. On the ninth or tenth postoperative day contact therapy is begun and treatment given on alternate days until total dose as high as 30,575 roentgens is given over a period of twenty-seven days.

No untoward results were observed in a series of 3 cases presented and the authors believe that in selected cases great deal more can be offered to a patient with carcinoma of the bladder by the use of this combined surgical and radiological method than by either fulguration or cystectomy.

D. E. MORGAN, M.D.

Tempesta, F. Urethral Calculus (Sella calcinosa urethrae). *Ann. Ost. di Riv.* 440, 9, 3.

The author reports the case of a forty-five year old man with complete acute urinary retention. The patient had never had renal colic. At the age of thirty he had acquired gonorrhea, which was cured after one year. This was followed by stricture which required internal urethrotomy and occasional dilatation. At various times there had been recurrences of symptoms, such as strong pains during micturition, interruption of the urinary stream, mild hemorrhage and small tumefaction on the ventral surface of the penis near the scrotum. Urethral catheterization demonstrated an obstruction several centimeters from the meatus. With difficulty a soft catheter was passed into the bladder; the urine was found to be turbid and alkaline and contained sediment rich in ammonium-magnesium phosphate. X-ray examination demonstrated a urethral calculus, one proximal and conico-cylindrical in shape and the other irregularly pyramidal in form. These were probably two fragments derived from one original calculus. Because of the stricture, removal of the calculus *per vias naturales* was out of the question. An external urethrotomy as done to the level of the stricture and the phosphate stones were removed. Exploration with a sound higher up toward the bladder revealed no other stones. The urethra was sutured over a semi-rigid catheter. The patient was cured and left the clinic after a forty-day hospitalization.

The author notes that this case is interesting because of the great rarity of urethral calculus and because of the large size of the calculus here. The male urethra because of its tortuosity, irregularity of caliber and stenoses both congenital and acquired is a suitable site for calculi. As to origin, these calculi may be either migratory or autochthonous. The former arise in the upper portions of the urogenital tract, and are stopped at constricted areas whether natural or acquired. The autochthonous type is most rare and the calculi are formed locally in areas of inflammation, stricture and diverticulum. These are usually paired calculi and attain large dimensions, as in diverticula. The mucous and fibrous exudates form the nucleus for the deposition of carbonates and phosphates of calcium and ammonium mag-

nesium phosphate. Frequently the nuclei are formed by foreign bodies or bacteria. Hellstrom has observed 90 cases of urinary lithiasis caused by the staphylococcus.

In the author's patient the calculus was autochthonous and due to stricture. The symptoms of such cases are varied and usually include dysuria, interference with the urinary stream, and urethrorrhagia. The diagnosis is easy when pain is followed by urinary retention. Palpation discloses a large calculus of the penile urethra. Catheterization helps diagnosis by showing arrest of the sound by a hard object. It also aids in determining the site of the calculus. Roentgenography and urethrography finally clinch the diagnosis. The treatment depends on the location and size of the calculus, as well as the condition of the urethra. Small stones may be passed naturally. If not far from the meatus they may be grasped by suitable forceps and withdrawn. When the latter procedure is impossible external urethrotomy is indicated. In difficult cases a cystotomy and even a prostatectomy may have to be done to remove a large calculus. There is a tendency toward recurrence of urethral calculi, for this reason it is preferable, when possible, to do an external urethrotomy so that a local stricture may be cured and all fragments of calculus cleaned out. JACOB E. KLEIN, M.D.

Mallone, T. Calculus of the Urethra (*La calcolosi dell'uretra*). *Ann. ital. di chir.*, 1940, 19, 109.

The author reports an unusual case of stone in the urethra and presents a thorough review of the literature on this subject. He notes that stone in the urethra is a very rare condition in urological practice. Burckhardt gives the incidence as 0.10 per cent and Britten as 0.82 per cent. Usually it occurs in males and affects individuals in the first decade of life. The infantile state of the prostate at this period permits the passage of large stones into the urethra. The calculus may be a primary formation in the urethra or may be secondary to formations higher up in the urogenital tract. In most of the cases there is a local stenosis with scarring, inflammation, and dilatation with urinary retention and sepsis. The characteristic site is the membranous urethra. In a series of 36 cases reported by English the following localization is noted: fossa navicularis, 11 per cent; penile urethra, 15 per cent; penoscrotal angle, 14 per cent; bulbar urethra, 19 per cent; and membranous and prostatic urethra, 41 per cent. A common predisposing cause is urethral diverticulum with urinary stasis followed by infection and ammoniacal decomposition of the urine. The symptoms vary according to the mode of onset. If sudden, there is acute pain with cessation of the urinary stream through the urethra, and also hemorrhage. Tenesmus of the urinary bladder and an associated urethrocystitis may also develop, or painful erections with pain at the time of ejaculation may be noted. Such symptoms lead to completion of the examination and diagnosis by use of urethral sounds, the urethroscope, and x-ray studies.

The prognosis is reserved and depends on the nature of the complications usually associated. Infection is the rule. There may be an ascending ureteropyelonephritis which may have a fatal termination through renal insufficiency.

The treatment is based on the conditions found in the individual patient. If the stone is in the prostatic part of the urethra it may be pushed back into the bladder by means of a sound and then removed by cystotomy or by lithotomy. If the stone has already passed through this part of the urethra it may pass spontaneously or may be grasped with forceps through the urethroscope. If such conservative treatment is unsuccessful, surgery is indicated. According to the location of the stone, either a cystotomy or an external urethrotomy is done. Even in the latter procedure some authors advise cystotomy for drainage of the infection.

Case Report. A seventeen-year old boy complained of symptoms of urinary disturbance. These symptoms were chronic in duration, having begun at the age of two years, when a cystotomy was done for urinary retention because of a stone in the bladder. Since then he had suffered at intervals from urinary distress, i.e., from polyuria, nocturia, and even hematuria. For the past three years he had noted a swelling at the root of the penis near the scrotum. He masturbated at times and noted that ejaculation was particularly painful. At the present time the general condition is essentially normal. Locally a hard, nut like swelling was noted at the under surface of the penis near the scrotal junction. There was a fetid, seropurulent secretion from the urethral meatus. X-ray examination revealed multiple calculi which occupied a large part of the urethra and the prostatic membranous portion. Urethrocytography demonstrated a considerable dilatation at the site of the pathology. The diagnosis was calculus of the urethra with chronic urethrocystitis. A cystotomy was done but the stone could not be delivered from above. An incision was made below in the median raphe and many stones were extracted. A drainage tube was inserted below and vesical lavage was done daily with permanganate. Subsequently the patient was completely cured after excision of the fistulous tract in the perineum under local anesthesia. Twenty-three calculi were extracted, varying in size from a nut to a seed. The entire collection weighed 62 gm.

There are photographs of the local condition and the stones removed at operation, and the histology of the excised portion of the urethra together with a bibliography is given. JACOB E. KLEIN, M.D.

GENITAL ORGANS

Lowsley, O. S. Total Perineal Prostatectomy. *J. Urol.*, 1940, 43, 275.

The author reports his modification of perineal prostatectomy as advocated by Young, believing that there is some improvement in the rapidity of healing, with the possibility of reduction of the incontinence.

Some type of regional anesthesia is used and the patient is placed in an exaggerated lithotomy position. The incision is made about 1 in. above the rectum and is deepened through the subcutaneous tissue until the central tendon is exposed. The fovea on each side of the central tendon is explored by blunt dissection, care being taken to avoid dissection too far laterally as the pudic nerve and vessels are liable to injury. The central tendon is incised behind the transversus perinei muscles which are retracted forward. The dissection is carried above the rectal wall until the apex of the prostate is encountered and the recto-urethralis muscle found. It is incised or pulled over to one side in order to expose the surface of the prostate which is recognized by its glistening fascia of Denonvillier.

Further exposure is obtained by separating the fibers of the levator until the fascia covering the seminal vesicles is seen. The posterior retractor is now placed in position. The prostate is excised from the membranous urethra, and the gland carefully mobilized, care being taken to leave the supra-

prostatic fascia. The prostate is now removed from the vesical orifice and, in cases of cancer, the seminal vesicles and ampullae of the vasa deferentia are also removed. Bleeding points are clamped and ligated.

The repair is accomplished by passing a ribbon-gut suture through the wall of the urethra, this is carried to the inside of the vesical orifice, over behind the apex of the trigonum vesicae into the bladder lumen again, and then to the outside of the urethral wall. The two ends are then tightly tied. This one suture acts as a hemostatic agent for all the cut edges. It approximates the vesical lumen to that of the urethra over catheter. It plicates the urethra, thereby reducing incontinence to a minimum. It also eliminates the necessity for packing or a bag. Drainage is maintained through a small urethral catheter. A Penrose drain is left in the wound for twenty-four hours.

This operation is indicated in early cancer, chronic pyelitis, intractable chronic fibrosis, calculosis, and in certain cases of tuberculosis and of adenoma of the prostate.

ELMER FLEMING, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC

Dunkmann, G Osteomyelitis and Its Prognosis (Die Osteomyelitis und ihre Prognose) *Ergebn d Chir u Orthop*, 1939, 32 527

This is an extensive study of the international literature on osteomyelitis and a review of material consisting of 314 cases of this disease from the author's own clinic. The author points out the regional difference in the course and severity of this disease. The number of purely traumatic cases is minimal. According to Walter the trauma must have been very severe, the localization of the disease must coincide with the site of trauma, and the osteomyelitis must follow shortly after, if the condition is to be considered of traumatic origin. The great number of methods of treatment—vaccine therapy, hemotherapy, iontophoresis, chemotropic therapy with electrocuprol or salvarsan, maggot therapy, periarterial sympathectomy, Orr's treatment, and the treatment of Payr and Loehr—are discarded. Following the use of the latter methods, which include fixation after opening, unguentolan tamponade and primary closure, removal of the sequestrum after three or four weeks, and renewed unguentolan tamponade and primary suture and fixation, the author saw repeated extensive phlegmons of the soft tissues and erysipelas, which he believes were due to primary suture. He believes the subperiosteal resection is of considerable value.

The author emphasizes the importance of evaluation of the result after complete healing. In the re-examination appalling results are frequently seen. In 133 re-examinations only 2 patients (who had had amputations) could be considered as completely healed. In 2 others a cure was highly probable. In all of the others there was a long-drawn-out illness interrupted by normal periods. In 1 case the interval lasted forty years. The mortality was 12.42 per cent.

The treatment of the acute cases was the multiple drill-hole method of Payr. If pus was present the bony bridges between the drill holes were removed with a chisel, the cavity was filled with unguentolan, and a few tension sutures were applied.

(LENKEIT) **LEO A. JUHNKE, M.D.**

Lindblom, K. On the Pathogenesis of Ruptures of the Tendon Aponeurosis of the Shoulder Joint. *Acta radiol*, 1939, 20 563

The author investigated the tendon aponeurosis after rupture for changes in (1) the anatomical structure, (2) the vascular system, and (3) the tensile strength. Clinical material was investigated for facts which might throw light on the pathogenic aspects.

Study of the clinical and anatomical material revealed

1 Rupture of the tendon aponeurosis of the shoulder joint required more than one causative factor.

2 A rupture did not occur in an individual under thirty years of age.

3 Pathologically there was primarily sclerosis of the tendinous tissue.

4 There were no indications that rupture of the tendon aponeurosis was due to wear.

5 There was no relationship between the age of the patient and the size of the rupture.

6 A study of vascular changes in the tendon aponeurosis gave no unanimous conclusions.

7 Histological findings of degeneration in the tendinous tissue could not be proved as being primary to the rupture.

From a study of the clinical material it appeared that primary trauma was an almost constant etiological factor.

Experiments in ruptures of the supraspinatus tendon aponeurosis demonstrated that injury took place with the arm abducted or externally rotated. Therefore ruptures of the subscapularis tendon aponeurosis should require internal rotation of the arm. Experimental investigations showed that rupture of the tendon aponeuroses often took place in stages.

RICHARD J. BENNETT, JR., M.D.

Lindblom, K. Arthrography and Roentgenography in Ruptures of the Tendons of the Shoulder Joint. *Acta radiol*, 1939, 20 548

The use of arthrography or bursography in the diagnosis of injuries to tendons of the shoulder was suggested by Codman, but he himself was unable to reach any demonstrable conclusions.

Instead of using the terms supraspinatus, infraspinatus, and subscapularis ruptures, the writer refers to ruptures in the respective part of the tendon aponeurosis of the shoulder joint. By the tendon aponeurosis is meant the continuous mass of fibrous tissue formed by the tendons of the short rotators and abductors of the shoulder and the coracohumeral ligament.

The material consists of 54 clinical cases of arthrographically diagnosed ruptures in the tendon aponeurosis of the shoulder joint or in the long biceps tendon, 50 clinical cases, examined arthrographically and found to have no rupture of the tendon aponeurosis or of the long biceps tendon, 3 clinical cases examined bursographically, in which no rupture could be demonstrated, and 38 anatomical specimens, dissected, roentgenographed, and in the majority of cases examined arthrographically and histologically.

Arthrographical technique. The patient lies on his back with his arm adducted and relaxed. A hypodermic needle 1 mm in diameter and with a short bevel is inserted about 1 cm anterior and lateral to

the acromioclavicular joint in the direction of the center of the head of the humerus. When the point of the needle is in the cartilage of the humeral head, the needle is withdrawn about 1 mm and the contrast medium, 6 c.cm. of 35 per cent perabrodil mixed with 1 c.cm. of novocaine, is injected into the joint. The roentgenograms are taken without delay since the contrast medium is absorbed rapidly.

The roentgen technique was done on Lyscholtz skull table. Three positions were used in order to provide tangential views of the insertions of the tendon pectoralis. In exceptional cases fourth position was added, which gave a picture of the joint as seen from the glenoid cavity. These four positions are very well illustrated in detail in the article.

In the normal arthrogram the contrast medium fills the joint cavity, the tendon sheath of the biceps, and the subacromial recess. The subacromial, subdeltoid, and subcoracoid bursae do not under normal conditions become filled from the joint. The appearance of the arthrogram in the various positions is described in detail. Technical errors which may complicate the interpretation of the arthrograms are discussed.

In general, ruptures of the tendon aponeurosis of the shoulder were situated near the greater or lesser tubercle and appeared to have begun in the part of the tendon those lying nearest the head. A rupture of the articular parts of the pectoralis always included the capsule, and a continued rupture including the superficial parts of the aponeurosis always extended to the wall of the bursa. Regarding the arthrographic appearance and the operability it was found advisable to divide the ruptures of the supraspinatus and infraspinatus portions of the pectoralis into four groups. Cases belonging to the first two groups were practically the only ones suited for operation.

The ruptures of the subacromial portion, as in the supraspinatus and infraspinatus portions, are located near the insertion. The diagnosis of this condition by arthrograms is discussed and well illustrated.

In only one case rupture of the long biceps tendon was confined to the tendon. In cases there as also a rupture of the bicipital portion of the pectoralis. The remaining cases showed lesions of the supraspinatus and infraspinatus portions.

Other roentgenological changes in ruptures of the tendon pectoralis are discussed and illustrated in detail. Comparison with the cases without rupture in the aponeurosis showed that the only pathognomonic sign of tendon rupture was the irritation of the greater tubercle and the inferior surface of the acromion, combined with an upward subluxation of the head.

In this material none of the clinical signs, as described by Codman and others, proved to be pathognomonic. On the other hand, the arthrography of the shoulder has possibilities of becoming an infallible method of detecting ruptures in the tendon

aponeurosis of the boulder joint and in the long biceps tendon. The same accuracy in the diagnosis of these ruptures cannot be reached by means of clinical methods, and ordinary roentgen examination of the boulder is of insignificant value in these cases.

RAC AND J. BRYANT JR. M.D.

Piergooni, A. Lesions of the Femoral Neck in Infantile Osteochondritis of the Hip (Sull'lesione del collo femorale nella osteocondrite infantile dell'anca). *Rivista Med.* 1930, 7:3.

Piergooni recalls that infantile osteochondritis of the hip is generally accepted as being essentially a lesion of the femoral epiphysis, but points out that nearly always there are also lesions in the acetabulum and of the neck of the femur. An enlargement of the articular interline appears early and when the epiphyseal lesions are further advanced the acetabulum presents an oval form. In the femoral neck the lesions may be early or late. The early lesions involve principally the metaphysis, or the portion of the neck immediately below the configuration cartilage, and may prevent the following roentgen picture: (1) more or less irregular foci of decreased density with indistinct borders, and which may or may not be circumscribed by opaque rings; (2) foci of cystic aspect with clearly marked and regular borders, which also may or may not be circumscribed by opaque rings; (3) irregular areas of increased opacity; and (4) marked increase of transparency involving the entire upper extremity of the femur and even extending beyond it to the humeral part of the pelvis. The late lesions begin during the evolutionary phase and cause irreversible changes in the bone: they include changes in the thickness, length, and the direction of the femoral neck. The first involve especially the part nearest to the cephalic nucleus and impart a gibbous aspect to the supero-external contour of the neck the second generally produce marked shortening of the neck which may disappear completely the third result in coxa vara, (including the bent form of coxa plana, or coxa valga, antetorsion, retrotorsion, version, or flexion).

In general, it may be stated that large numbers of cases of osteochondritis present lesions of the neck and particularly of the metaphysis which establish themselves during the period of evolution of the disease: they consist primarily of irregular foci of bone rarefaction or more frequently of typical semi-oval, metaphyseal foci. These foci of rarefaction must be accepted as having great importance in the picture of osteochondritis, as they represent probably the primary metaphyseal process from which result part or all of the other changes in the neck. In fact, the metaphyseal foci constitute a process similar to that developing at the same time in the cephalic nucleus, but of lesser gravity and duration. This confirms the concept of Bertolotti that in osteochondritis of the hip there are combined epiphyseal and metaphyseal lesions or that osteochondritis is especially a metaphyseal process. The

lesions found in the metaphysis are not secondary to those of the epiphysis, as claimed by many authors, both run parallel and are due to the same primary cause. In addition, in some individual cases there may be infectious metaphyseal foci which are correlated with but not directly caused by the metaphysitis. As a result of the metaphysitis, other phenomena arise, consisting of cystic formations, zones of osseous condensation, and diffuse osseous atrophy, the periosteal reaction in the neck and the lesion of the conjugation cartilage cause real thickening and shortening of the neck with changes in the orientation of the neck and head.

The described metaphysitis may also occur alone without lesions of the cephalic nucleus, but then it assumes the roentgen aspect of Bertolotti's upper femoral metaphysitis, called by others "infantile coxa vara" or, erroneously, "congenital coxa vara." Although this morbid form is distinct from metaphysitis for many reasons, the two diseases have nevertheless a basic pathogenetic and anatomical identity which requires their inclusion in a larger entity, osteochondritis of the hip. This term consequently means a meta-epiphyseal dystrophy of growth localized solely in the metaphysis (metaphysitis of Bertolotti) and leading to the formation of coxa vara, or in the epiphysis and the metaphysis at the same time (meta-epiphysitis or disease of Calvé Legg-Perthes-Waldenström) and leading to the formation of coxa plana.

RICHARD KEMEL, M D

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC

Young, F. The Use of Autogenous Rib-Cartilage Grafts to Repair Surface Defects in Dog Joints. *Surgery*, 1940, 7 254

In a series of dogs, grafts of rib cartilage were transplanted into surgical defects made in the cartilage of non-weight bearing areas between the femoral condyles. The defects were made down to the subchondral bone. When the graft was accurately approximated, it healed in place with fibrous-tissue connections and remained viable for at least one year. There was, however, fibrous union of rib cartilage and articular cartilage. When several rib-cartilage grafts were placed in parallel strips on the denuded surface of the knee joint, it was found that these healed to each other by cartilaginous union, but the grafts united to the articular cartilage with fibrous tissue.

CHESTER C. GUY, M D

Guibal, A., and Ginestí, J. Can the Condemnation of the Chopart Disarticulation Be Revised? Anterior Tenosuspension Complementing the Calcaneus (Peut-on réviser la condamnation de la désarticulation de Chopart? Ténosuspension antérieure complémentaire du calcaneum). *Rev de chir*, Par, 1939, 58 673

The midtarsal disarticulation of Chopart has been condemned by a great many surgeons over a long

period of time. This condemnation has been apparently well deserved because of the very poor functional results which have followed this type of disarticulation.

The anatomical longitudinal arch of the foot is supported by the anterior and posterior extremities of that arch which is made up primarily of metatarsal bones and ligaments. The apex of this arch is the site of the midtarsal amputation of Chopart. The medial portion of the longitudinal arch is supported posteriorly by the calcaneus and anteriorly at the metatarsophalangeal articulation. This bony longitudinal arch is supported also by several important ligaments.

The movements of the ankle at the tibiotarsal articulation are produced by the action of two antagonistic groups of muscles, the anterior group and the posterior group. The greatest disability occasioned by Chopart's disarticulation is the inversion of the stump because after Chopart's disarticulation there is no longer any support on the posterior tuberosity of the calcaneus. When inversion of the foot has once set in following Chopart's disarticulation correction is very difficult.

Methods to prevent the inversion of the foot following the disarticulation may be classified under (1) prosthesis, (2) orthopedics, and (3) operation. Not any one of the three methods is sufficient in itself, as it requires the combination of all three to obtain good end results.

1. Prostheses. It is suggested that a solid anterior support is necessary and that the bottom of the shoe should be supported by a double rigid sole, which in turn will produce the curve of the plantar arch.

2. Orthopedic measures are very essential from the standpoint of postoperative care and every means should be used in order to give a movable tibiotarsal articulation.

3. Operative means. Since the inversion is primarily due to mechanical factors, attempts are made to do away with these factors. The answer to the problem seems to be the re-establishment of the combined action of the antagonistic muscles at the tibiotarsal articulation. A lengthening of the tendo Achillis is carried out in some cases. The anterior tenosuspension of the calcaneus is primarily done by passing the tendons through a tunnel in the anterior part of the calcaneus. Physiological principles must be maintained in order to get a good functional result. The good points of the anterior tenosuspension are (1) it is opposed in part to inversion of the stump, and (2) it permits a suitable working stump with an almost normal gait.

In the technique of the anterior tenosuspension of the calcaneus each of the individual tissues involved must be dissected and isolated to make a more spacious plantar fragment possible. Care must be taken in making the dorsal incision not to cut the extensor tendons. Each of the tendons is marked with a thread of catgut. The typical Chopart disarticulation is then carried out with the tendons raised and out of the field of operation. A hole is

drilled through the anterior portion of the calcaneus from 3 to 4 mm. behind the anterior articular surface and a gutter is made on the head of the astragalus, vertical in direction, for the tendons of the extensor proprius of the great toe and of the anterior leg. These tendons are passed through the tunnel to the side opposite their origin and then entered well up on that side to the opposite tendon. During operation the foot is to be maintained in flexion of about 80 degrees. The flaps are sutured.

The authors believe the use of the technique just described, with postoperative care and prostheses, will make poor results a thing of the past.

RICHARD J. BRIGHT, JR., M.D.

FRACTURES AND DISLOCATIONS

Van der Grint, M. Fractures of the Plateau of the Tibia (*Les fractures du plateau tibial*). *J. de chir.* 949, 35-37.

Van der Grint defines the plateau of the tibia as that part of the bone which lies above a horizontal plane passing through the lower border of the anterior tuberosity of the tibia, with the exception of the spine of the tibia. The author considers the term "tuberosity" or "plateau" to be preferable to the term condyle to designate this portion of the tibia.

There are many different types of fracture of the plateau or tuberosity of the tibia. They are best classified into two main groups, linear fractures and crushing fractures. Each of these two groups includes several varieties. Lesions of the menisci occur in 30 per cent of these fractures. Whether caused by a direct or an indirect force, fractures of the plateau of the tibia are always due to a move-

ment of hyperadduction or hyperabduction, the resistance of the lateral ligaments to dislocation being greater than that of the bone to pressure. Both tuberosities may be fractured, either by crushing force involving both simultaneously or by a crushing fracture of one tuberosity and a fracture en bloc of the base of the other; the latter is due to extreme hyperadduction.

The most important symptoms of fracture of the plateau of the tibia are the lateral movements of the limb and the formation of hemarthrosis; the degree of disability depends upon the site and extent of the fracture. Deviation of the limb in valgus or in varus is usually noted. Roentgenological examination is necessary for exact diagnosis; roentgenograms should be made from the front, in profile, and obliquely.

In treatment, closed reduction is often effective, with immobilization of the limb on an inclined plane and in position of overcorrection; in some cases continuous extension is employed. Open reduction is not indicated unless closed reduction fails. In linear fractures, replacement of the fragment in correct position and fixation with a metal prosthesis is indicated; in crushing fractures bone grafts are necessary to replace the loss of bone substance. Immobilization must be maintained for from eight to twelve weeks according to the case; recovery is slow and depends to a great extent upon the co-operation of the patient for satisfactory functional results.

At the St. Antoine Hospital of Brussels, 21 of 26 cases of fracture of the plateau of the tibia have been followed up, but of these for only few months after the accident, in 6 of the remaining 10 cases, the results are satisfactory and in 4 they are poor.

ALEX. M. METZEL.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Funck-Brentano, P The Differential Diagnosis of Arterial Emboli of the Legs (Le diagnostic différentiel des embolies artérielles des membres) *Presse méd*, Par, 1939, 47 1569

In a discussion of the differential diagnosis of arterial emboli the author asserts that the diagnosis of an arterial embolus is often very difficult to make. In cases of acute arterial occlusion the diagnosis of the pathological cause of the ischemia depends upon the acuity and beliefs of the clinician. According to the teachings of Mars, the embolus in its different modalities may often be the cause of the pathological changes. However, it is relatively rare that this etiological embolus can be confirmed. According to Fontaine the large dimensions of certain clots and the frequency of recurrence after embolectomy indicate that quite often a thrombus has been mistaken for an embolus. The author agrees with Langeron that the embolus is the rarest cause of arterial obliteration.

FREDERIC W. ILFELD, M.D.

BLOOD, TRANSFUSION

Rostock, P Hemostasis and the Replacement of Blood (Blutstillung und Blutersatz) *Med Welt*, 1939, p 1331

In order to apply proper and useful measures for hemostasis in injuries one must have clear conceptions about spontaneous hemostasis. There are three processes that enable the body to cause a hemorrhage to stop: (1) the contraction of the musculature of the vascular wall, (2) the rolling-in of the injured intima, and (3) the secondary thrombosis at the site of the injury. As a result of the irritation of the injury of the blood vessel the musculature contracts up to the next higher site of the division of the blood vessel, as a result of which the vascular lumen is constricted up to occlusion. This process is of predominant importance in spontaneous hemostasis. The second factor is the rolling-in of the intima at the vascular wound, as a result of which the transverse diameter of the bleeding vessel is diminished in a purely mechanical way. This effect is the least with a smooth cut, but very decided in crushing and tearing of the blood vessel, and for this reason there is no escape of blood in an avulsion of an extremity. The rolling-in of the intima results in such a way that the wound surface comes to lie toward the lumen of the vessel, and the stimulus for the thrombosis arises from this open wound site. Together with its excretion of fibrin and later organization by connective tissue, this is the important prerequisite for the later definitive cicatrization of the vascular injury, but plays only a very subordinate part in the process of primary hemostasis.

For the practical measures in the treatment of an acute hemorrhage, the provisional and the final hemostasis must be kept apart. It is not necessary nor indicated, as still often is done, to tie off the affected extremity in every hemorrhage. Parenchymatous hemorrhages usually cease spontaneously after a short time, and covering with sterile gauze suffices. Venous hemorrhages, no matter how severe they are, always cease with a compression bandage when the body is laid flat and the extremities are elevated. In arterial hemorrhages the cessation of the escape of blood can be achieved by compression of the artery with finger pressure at the known sites. With the smaller vessels from five to ten minutes of pressure usually suffice to occlude the source of the hemorrhage. If the bleeding does not stop after this time, only then the application of an Esmarch bandage is indicated. However, it must be drawn tightly so that the arterial flow is truly stopped, as otherwise the bandage acts statically and increases the hemorrhage. The bandage must never be applied longer than two hours, not even if a definitive hemostasis has been impossible within this time. It may be hoped that within this time the opened blood vessel has become occluded by the automatic aid of the body, even though the conduction of stimulation in the vascular tube has been disturbed by the application of the Esmarch bandage. The definitive hemostasis results from ligation of the vessel at the site of its injury. In the case of the popliteal artery, a vascular suture, possibly together with a free transplantation from the saphenous vein, should be done instead of a ligation, so as to avoid a threatening gangrene. Stimulants are indicated and allowed only after the final hemostasis has occurred.

In connection with marked losses of blood, measures for their replacement should be taken. In the absence of alarming conditions the administration of warm fluids by mouth or rectal drop infusions suffice. Autotransfusion has a limited purpose, it is applicable only for two hours, and after that the blood flows back into the legs that have been made bloodless in a more marked degree and thus a new deficiency of blood occurs in the rest of the body. A transfusion with normal saline solution or with whole blood is also occasionally recommended, possibly with the addition of stimulants. However, if the loss of blood is so great that the erythrocytes still present are not sufficient for the necessary gaseous metabolism, the transfusion of sufficient amounts of living blood from another person may receive consideration. The transmitted erythrocytes remain functionally active up to thirty days—a period of time sufficient for the body to supply its own replacement. With a proper selection of a donor dangers are no longer to be feared. The former method for the avoidance of coagulation with the use of sodium citrate is now replaced by the use of vetren, which is derived from

the liver. The blood transfusion not only replaces the loss of blood and prevents death from exsanguination, but also acts as a hemostat and forms a marked stimulant for the hematopoietic organs of the body the activity of which stimulates them greatly to the utogenous replacement of the lost blood.

(Boon.) LOUIS NEWELL, M.D.

Edwards, F. R., Kay J., and Davis, T. B. The Preparation and Use of Dried Plasma for Transfusion. *Brit. M. J.* 1940, 377

The authors note that the formation of blood banks has made available considerable supply of plasma for therapeutic use. It is the plasma element that produces the desired effect in many blood transfusions which are given. It is the plasma proteins combined with fluid which appear to be responsible for the resuscitative action in wound shock, post-operative shock, and burns. Further advantages of the plasma are that it will keep indefinitely, and for its administration no grouping of the recipient is necessary.

A brief consideration of the physiopathology of plasma proteins is given. The method of preparing plasma is discussed. The plasma should be kept in a refrigerator at 4 degrees C. Under these conditions of storage, the plasma will keep indefinitely.

Although the administration of pure plasma has been satisfactory, it was felt that if the product could be dried the problem of storage and trans-

portability could be greatly simplified. Plasma may without detriment be heated to 33 degrees C. At this temperature the low vacuum produced by an ordinary standard filter pump will cause it to boil. To prevent the frothing that occurs during ebullition a continuous-feed plasma drier has been used. When completely dried, the granules are crumbled to fine powder and are stored in ampoules.

One hundred cubic centimeters of citrated plasma gives about 8 gm. of the dried product, which is pale yellow crystalline powder that dissolves readily in warm water. The reconstituted plasma is indistinguishable in appearance from the original product. It can be stored at room temperature and still apparently remain effective indefinitely.

The rationale for the administration of plasma in wound shock, postoperative shock, incipient pulmonary edema, burns, nephritic edema, and nutritional edema is discussed. Twenty grams of dried plasma dissolved in 25 c.c.m. of distilled water or 500 c.c.m. of 5 per cent glucose in distilled water are equivalent to plasma-protein value to 1 pt of citrated blood.

The experience of the authors in transfusion is not great enough to fully assess the value of dried plasma but the anti-shock property of this substance appears to be comparable to that of whole blood. It seems to be ideal for use in cases of emergency in which no supply of blood is easily available, and in war surgery.

HAROLD F. THURSTON, M.D.

POSTOPERATIVE ATELECTASIS AND RELATED PULMONARY COMPLICATIONS

Collective Review

JOHN A GIUS, M D, Med Sc D, Portland, Oregon

A CONSIDERABLE number of articles on postoperative pulmonary complications have been published since the careful review of Mathes and Holman (69). These papers have dealt largely with clinical observations and the therapy of these conditions. Several important papers of an experimental nature, however, have appeared, which in general tend to support the obstruction theory of the development of atelectasis and postoperative pneumonia. The importance of the problem is obvious, and only by constant vigilance and attention to detail can these conditions be prevented. Gray (45) has stated, "Pulmonary complications constitute the greatest single hazard in abdominal surgery, and if death cannot be ascribed to them, not infrequently they reduce the actual defensive forces so that a fatal outcome ensues when recovery might otherwise have followed."

The predominant postoperative pulmonary complication is atelectasis, and the related conditions include bronchitis, massive collapse, and postoperative pneumonia. It is apparent that to include a discussion of certain other affections of the lung occurring postoperatively would necessitate much greater length than can be given here, and indeed would detract from the main point of this review, namely, the study of those conditions occurring within the first four or five days after operation. Veal (100) has indicated that pulmonary embolism and infarction in one sense are not pulmonary complications at all, but vascular accidents resulting from surgery which are not due, strictly speaking, to a pulmonary condition. For this reason, pulmonary embolism and infarction, fat embolism, pulmonary abscess, gangrene, and bronchiectasis are not included in this review.

The history of the development of the present concept of postoperative pulmonary complications forms an interesting chapter in the history of medicine. This aspect has been reviewed many times (Bowen, 14) and only a few of the high points should be recalled.

From the Department of Surgery, University of Oregon Medical School, Portland, Oregon.

With the advent of surgery and especially with the discovery of anesthesia, pulmonary complications were recognized as common sequelæ to operation. These were referred to as "ether pneumonia," but with the development of other types of anesthesia it was observed that similar complications occurred with equal frequency when they were used. Thus, it was soon demonstrated that the anesthetic *per se* was not the primary cause of the trouble. Jorg (60) in 1823 described the presence of incompletely aerated lungs in the newborn and coined the word "atelectasis" from the two Greek words, "ateles" meaning imperfect and "ektasis" meaning expansion. Traube (95) showed in 1844 that atelectasis following section of the vagus or recurrent laryngeal nerves was due to the entrance of buccal secretions into the air passages. Gairdner (43) recognized that collapse of the lung occurred in a variety of cases, and believed bronchial obstruction to be the primary cause. Lichtheim (66) in 1879 proved beyond any doubt that collapse of the alveoli was due to absorption of the alveolar air into the blood stream. It was not until the term was revised by Pasteur (75, 76), Bradford (15), and Scrimger (85) that such a condition was considered in the literature regarding postoperative pulmonary complications. Bibergeil (13) following a comprehensive study of these conditions stated, "It is due in part to the instinctive dread of pain and in part to protective reflex inhibition. The tendency to inflammation is further aggravated by the difficulty of effectually clearing the lungs of offending matter by coughing."

Elliott and Dingley (39) in 1914 studied a series of 11 cases of massive collapse following operation and concluded that this condition was secondary to bronchial obstruction. They recommended deep breathing and coughing as the preferred treatment, and suggested pneumothorax as a therapeutic consideration. Cutler and his associates (34, 35) subsequently published a series of papers on this subject, the thesis of which was that emboli arising from the operative site and passing to the lungs are the chief etiological factor. About this time Whipple (104) analyzed a series

of 97 cases of "pneumonitis" occurring among 3,719 patients operated upon in the Presbyterian Hospital, New York City during the years 1915 and 1916. He listed the following predisposing factors:

1. Local inflammations in the upper respiratory tract and factors favoring them.

2. Vasomotor changes causing a congestion of the pulmonary vessels.

3. Factors inhibiting the normal thoracic and abdominal respiratory movements and favoring atelectasis and hypostasis in the lungs.

4. Local or general infections elsewhere than in the respiratory tract.

5. Debilitated states resulting in a lowered natural or acquired immunity to the particular organism inciting the pneumonitis.

6. Factors increasing the virulence of the inciting organism.

The first four of these factors cover most of the predisposing causes of pulmonary atelectasis as we view it today. Subsequent work has elaborated chiefly on the factors in Group 3 (Snyder 89).

It was Whipple's belief that these conditions were the result of extension of infection from the upper respiratory passages into the lung with the production of inflammation or pneumonitis.

Jackson and Lee (57) produced atelectasis in dogs by the intrabronchial injection of mucus obtained from a patient with pulmonary disease and then obtained rapid re-inflation of the collapsed portion of the lung by removing the plug bronchoscopically. Coryllos and Blumberg (8, 29, 31, 32) in an extensive experimental study demonstrated that bronchial occlusion was the primary cause of atelectasis. They showed that subsequent absorption of air distal to the plug occurred on a purely physical basis, and if virulent organisms were present in the retained secretions a cellulitis and rapidly spreading infection resulted unless prompt removal of the occluding mucus plug occurred. Thus, they contended that postoperative pneumonia was a condition secondary to atelectasis.

PHYSIOLOGICAL CONSIDERATIONS

The normal lung is expanded by hydraulic traction on the visceral pleura by the outward moving thoracic walls (Andrus, 2). Thus, the lungs play only a passive rôle in respiration and are subject to changes in the chest wall and diaphragm. During inspiration the thoracic cavity is increased in all diameters—that is, the anteroposterior dimension is increased by elevation of the sternum and ribs; the transverse diameter is increased by ele-

vation of the ribs, the so-called "bucket-handle" movement; and the vertical diameter is increased by descent and forward motion of the diaphragm. The portions of the lung which are expanded directly are those in contact with freely movable boundaries of the thorax—namely the sternum, ribs, and diaphragm. Macklin (68) has shown that the lung root moves downward, forward, and laterally during inspiration, and that the bronchial tree is elongated. With descent of the diaphragm there is a decrease in intrapleural pressure which is considerably greater in the supradiaphragmatic region than in other areas (Best and Taylor 12). It is estimated that the action of the diaphragm is responsible for about 60 per cent of the ventilation of the lung normally. Hoover (54) has indicated that the diaphragmatic movement accounts almost entirely for the ventilation of the lower lobes. During respiration the diaphragm moves up and down like a piston and changes its shape only slightly. The costal part moves downward and forward and pushes the abdominal viscera before it. The abdominal wall distends, but when resistance is offered by the abdominal muscles, the downward movement of the viscera is hindered. At this point the force of the diaphragm is spent in raising the lower ribs to which it is attached (Best and Taylor 12). Under normal conditions the excursion of the anterior abdominal wall is a direct measure of phrenic excursion. It is obvious, therefore, that conditions which alter intra-abdominal pressure or abdominal wall tones, such as distention, peritoneal irritation, abdominal-wound pain, and associated spasm, will influence the diaphragmatic excursion and ventilation of the lung (Patey 77, Carlson, 23, 24, Beecher 8, Capelle 22). When these factors produce a decrease in the abdominal component of respiration, a tendency toward compensation by the thoracic components of respiration is noted (Carlson, 23, 24, Beecher 8).

Many authors (Head 48, Churchill and McNeill, 26, Powers 78, Patey 77, Carlson, 23, 24, Beecher, 8 and others) have reported a fall in the vital capacity which occurs after abdominal operations. This decrease is greatest in operations on the upper abdomen and the level following operation in this area usually ranges from 20 to 40 per cent of the normal for the particular individual studied during the first few days after operation. Return to normal is gradual so that the pre-operative level is usually reached by the tenth or twelfth day. Khromov (61) found that the fall in vital capacity was less and the return more rapid if the patient was allowed out of bed early.

Whereas inspiration is an active phenomenon, expiration during quiet breathing is entirely passive. The thoracic framework, through its own weight, together with the elastic recoil of the lung and relaxation of the diaphragm, allows the lung to resume its former position. With fluctuations of the diaphragm, alterations in both intrapleural and intra-abdominal pressures occur which account in a large measure for movement of blood through the large veins back to the right heart (Wilson, 105). There is, therefore, a definite circulatory function ascribable to respiration and especially to diaphragmatic excursion. This has been referred to as the "pumping action" of the diaphragm and its importance as regards postoperative venous stasis, thrombosis, and embolism has been stressed. Frimann-Dahl (42), however, has noted that the decrease in diaphragmatic excursion was greatest on the first postoperative day, while the slowing-up of the venous return occurred later, and in fact the curve of each seemed to be in opposite directions. He concluded that the diaphragm was not the chief factor in the slowing-up of the venous circulation.

It should be noted that an interrelationship between ventilation and circulation of the lung has been quite conclusively demonstrated by numerous workers. Coryllos and Birnbaum (30) stated, "circulation and ventilation of the lung are parallel functions, where ventilation is impaired circulation is decreased and conversely." They found progressive impairment of circulation in the atelectatic lung which was due to collapse of the alveoli and not to capillary thrombosis or capillary compression by the alveolar exudate. Adam and his co-workers (1) found a decreased volume of blood flow associated with passive congestion and an ideal situation for bacterial invasion in massive atelectasis. Thus it is clear that hypoventilation and atelectasis affect profoundly both the systemic and pulmonic circulation. Overholt (74) regarded pneumoperitoneum as a possible cause of a high diaphragm after operation, but subsequent investigators (Beecher, Bradshaw and Lindskog, 10, Carlson, 23, 24) have reported that the degree of pneumoperitoneum which would be required to produce this effect would have to be far in excess of that resulting from laparotomy. Positive pressure, however, such as that produced by distention of the gastro-intestinal tract, causes a definite impairment of respiratory exchange. It is conceivable also that distention might cause a secondary decrease in the diaphragmatic excursion by virtue of the fact that internal pressure on the wound might produce pain sufficient to bring about a reflex splinting of the diaphragm.

The condition frequently called "hypoventilation" has been repeatedly demonstrated after abdominal operations (Patey, 77, Carlson, 23, 24, Beecher, 8). This results from a number of factors which have already been mentioned. Henderson (49) has stressed the rôle of tonus in maintaining the normal capacity of the lungs. It is the tonus of the respiratory muscles that normally keeps the thorax and, thus, the lungs expanded, and prevents atelectasis. He believes that loss of tonus not only affects the lungs, but also profoundly affects the whole organism because of the dependency of the so-called "venopressor" mechanism on tonus in all muscles. This mechanism is the chief factor in the return of blood to the right heart.

With a decrease in tonus which may follow a surgical operation, physical injury, anesthesia, or severe illness, a diminution in the size of the thoracic cavity and a partial deflation of the lungs are produced. This condition has been called "collapse without symptoms" by Beecher (9), who found it after more than 80 per cent of laparotomies.

Thus the groundwork for certain essential factors leading up to actual obstruction of the bronchial tree is set. At this point, secretions which have been retained in the bronchioles or bronchi produce obstruction to the passage of air distally. If obstruction persists, rapid absorption of air into the blood stream occurs. The air from the occluded area is absorbed exactly as from any other body cavity. As the air is absorbed the lung is gradually collapsed under the pressure of the atmosphere bearing down through the trachea and bronchi into the other lung and by elevation of the diaphragm by the pressure of the atmosphere upon the abdomen. This appears to be the complete explanation of why it is that a plug in a main bronchus results in collapse of the lung on that side and an expansion of the other lung to fill part of the other space (Henderson, 49). That there is essentially no difference between lobar and lobular collapse is stressed by Coryllos (27). Wangenstein (101) believes, however, that although the lobular type of atelectasis results chiefly from the presence of thick viscid mucus in the tracheobronchial tree, the temporary ablation of the diaphragmatic component of respiration following abdominal operation is the most important factor in the genesis of lobar or massive atelectasis.

The possibility of reinflation of collapsed lobules by the passage of air through the interalveolar pores (Kohn) from adjacent air-containing alveoli has been shown by Van Allen and his collabora-

tors (93, 99) Thus, unless the collateral respiration" of the obstructed portion of the lung is blocked by inflammatory exudate and edema, areas of lobular atelectasis may be re-inflated by this mechanism. It is clear that complete lobar obstruction does not allow this mechanism to operate. Whether the interalveolar pores are normal structures or artefacts due to stretching or tearing of the alveolar membrane from various causes has not been settled to the satisfaction of all investigators. The latter view however is held by most anatomists (Larsell, 64) It would seem that this mechanism adequately explains the striking results obtained clinically by hyper ventilation and coughing.

Band and Hall (6) showed experimentally that three factors were necessary for the development of atelectasis. These were (1) an intrabronchial content of a definite viscosity (2) abolition of the cough reflex and (3) limitation of respiratory movement. This work confirmed much of that done by Coryllos and Blumberg, and their concept of bronchial obstruction with secondary pulmonary collapse is almost universally accepted as the predominant postoperative pulmonary complication (editorial *J Am Med Ass* 36).

Bacterial invasion of the collapsed area proceeds usually from organisms contained in the mucus plug. This results in an inflammatory process, to which Whipple (94) applied the descriptive term "pneumonitis." A great variety of organisms may be cultured from the involved area. Nearly always these are derived from the upper respiratory passages and in the greater percentage of the cases pre-operative cultures of the nasopharynx will yield the same organism that predominates in the affected lung (Sutcliffe and Steele, 91) The severity of the symptoms will depend upon the following factors (1) the amount of the lung collapsed and the displacement of the mediastinum and traction on the great vessels which results (2) the degree of pneumonia in the atelectatic lung and (3) the type and virulence of the organism causing the pneumonia (Schindler and Gough, 82).

The lungs have been called the best drained organs in the body. The normal mechanisms for keeping the tracheobronchial tree patent are the cough reflex, the ciliary activity of the bronchial epithelium, and the peristaltic action of the bronchial air passages. With inspiration a definite dilatation of the bronchial tree occurs and with expiration the reverse is noted. Hyperventilation increases these actions and consequently may result in the freeing of obstructing plugs from the bronchial wall.

Jackson has called the cough reflex "the watch dog of the lungs, and its importance in clearing the respiratory passages cannot be overemphasized. It is a common observation that following abdominal operations particularly of the upper abdomen the patient is unable to cough effectively because of pain in the operative wound. Not only is this a factor in decreasing the effectiveness of cough but the degree of hypoventilation and the lowered vital capacity after operation require that much of the inspired air be utilized in sweeping out the dead air space rather than in evacuating the mucus plug. In this respect ineffective coughing postoperatively has the same basis as collapse without symptoms which has been described by Beecher (9). The unavailability of cough in the removal of the tracheobronchial contents has been stressed by Brown and Archibald (17) They found that many times cough would spread the contained material deeper or into the other portions of the lung. Likewise material contained in the air passages which stimulates cough normally will not produce cough if retained for some time because a tolerance to the foreign material is gained and a temporary loss of the cough reflex results. Jackson (35) showed that material in the finer divisions of the tracheobronchial tree and the alveoli excites less cough than is noted under similar conditions in proximal portions.

Posture likewise plays an important part in effective coughing. The semi Fowler position which is so popular during the postoperative course aids somewhat in the ventilation of the chest but a disadvantage is the tendency for secretions to gravitate to the most dependent portions of the lung. Here they produce obstructive and inflammatory phenomena usually in the lower lobes. Faulkner (40) has termed this "internal drainage." On the other hand, if the Trendelenburg position is utilized, or the lateral position with elevation of the foot of the bed postural drainage of the secretions is effected and they are brought from the relatively less sensitive areas to the larger ramifications where cough will result in their evacuation. Similarly the lateral position with the involved lung uppermost will provide postural drainage of its bronchial tree. The danger when the latter position is maintained is the introduction of secretions into the uninvolved dependent lobes. This can be obviated by frequent changes in position. Haight (47) has indicated the following reasons for the retention of secretions (1) the inability or unwillingness of the patient to cough effectively (2) the lack of application of helpful measures for aiding cough and

expectoration, and (3) improper instruction of the patient regarding the necessity for effective cough and expectoration

Henderson (49), as previously noted, has stressed the importance of the venopressor mechanism and its failure during the state of postoperative depression. He believes that this is one of the chief predisposing factors in the development of postoperative pulmonary complications. Moon (70), who has made extensive studies of the pathology of shock, suggests that postoperative pneumonia is a manifestation of a sublethal degree of shock. He observed secondary pneumonia in hyperemic edematous lungs of patients who died several days after extensive surgical procedures. Blood studies on these patients showed marked degrees of hemocoagulation, which indicated that the mechanism of shock was operative. The post-mortem findings were comparable to the pulmonary changes noted in many other conditions and the essential pathological pattern of shock was present in all. This consisted of congestion, stasis, and edema of the lungs. Takacs (92) stressed the rôle of the carbon dioxide-oxygen balance in maintaining the central control of respiration. He found that sudden collapse of the lung results in a profound upset in the carbon dioxide-oxygen exchange and an inability of the respiratory center to respond promptly. This would seem to be of particular importance in lobar or massive collapse. In addition to the usual factors which he accepts, Sauerbruch (81) suggests that a reflex nervous influence may excite pathological changes in the lung after upper abdominal operation. This condition might be analogous to the postoperative atony of the gastro-intestinal tract and is due to irritation of the abdominal vagosympathetic system. Zukschwerdt and Lezius (106) have suggested that changes in tonus of the sympathetic nervous system may produce constriction of the bronchi. The possibility that these changes are due to toxic products liberated from the field of operation is inferred in their writings. Although the literature of previous years has contained frequent references to the rôle of allergy in pulmonary complications, most recent authors have given little space to its consideration. Lueth (67) claims it is a frequent etiological factor.

PATHOLOGY

The atelectatic portion of the lung is shrunken, airless, firm, gray in color, and sinks in water (Snyder, 89). The bronchi are often filled with tenacious densely adherent mucus. Microscopically the alveolar walls are engorged with blood, and the alveolar spaces are flattened and small. They

may contain a homogeneous mucoid substance and a variable amount of cellular exudate. Adam and his coworkers (1) observed that shrinkage of tissue with atelectasis produces a decreased cross section of the vascular bed as well as marked tortuosity of the vessels.

The lung in postoperative pneumonia is very dark violet in color and a thick mucopurulent secretion can be made to exude from the bronchioles on compression. The alveolar surfaces are closely approximated and the alveolar spaces are obliterated. The alveolar capillaries are collapsed and the arterioles are dilated. A fibrinopurulent exudate is present in the bronchioles (Starr, 90).

Moon, who has suggested the rôle of shock in postoperative pneumonia, notes that the lungs are heavy, wet, and of increased density. The areas of consolidation may vary greatly in size, distribution, and number. The sections show marked engorgement of the capillaries and venules, and albuminous fluid filling the alveoli. It is possible that the type of changes described by Moon (70) are the result of vascular changes primarily, while the picture produced by atelectasis and secondary pneumonia is due to changes intrinsic to the lung. Coryllos believed that atelectasis was the common factor in the development of postoperative pneumonia as well as primary pneumonia.

Zukschwerdt and Lezius (106) emphasize the importance of the mediastinal shift and traction on the great vessels in massive collapse. They point out that it is impossible to demonstrate these changes at autopsy unless the trachea is ligated before the chest is opened.

BACTERIOLOGICAL CONSIDERATIONS

The presence of infection in the upper respiratory passages has long been recognized as a predisposing factor in the development of postoperative pulmonary complications. It is now universally accepted that all elective surgery should be deferred for at least a week, or preferably two, after a cold has cleared up. Also, operation in the presence of a rhinitis, sinusitis, pharyngitis, laryngitis, dental infection, or any similar infectious condition should be regarded as extremely hazardous. All efforts should be made to clear up both acute and chronic infections in the upper, as well as the lower, respiratory passages before surgical procedures are carried out.

Most healthy individuals harbor pneumococci and streptococci in their oronasal secretions (Band and Hall, 6). Coryllos found Group IV pneumococci in about 40 per cent of his patients and believed that the great viscosity of the bronchial

secretions, so characteristic of bronchial stasis, results from the rapid growth of the pneumococci. Thus, the viscosity of the bronchial secretions is sufficient to produce obstruction of the small and even the large bronchi. The more virulent the pneumococci the greater is the viscosity of the exudate formed (Levin, 65).

Several investigators (quoted by Suttiff and Steele, 91) have determined that pneumococci can be found in the throats of one-half of the normal people given a single examination, and as the number of examinations and the period of time over which they extend are increased the proportion found to harbor pneumococci is also increased to nearly 100 per cent. More than one strain may be present, and changes in the strain present may occur frequently. Other organisms, such as the beta hemolytic streptococcus and Friedländer's bacillus, are less often present.

Turnbull (97) believes staphylococci and streptococci are usually associated with the lobular type of atelectasis, and if anaerobic organisms are imprisoned, destruction of tissue may follow the pneumonitis with the production of an abscess.

Suttiff and Steele (91) studied the interrelationship of infection and hypoventilation. They took repeated cultures of the pharyngeal flora on 16 patients before and after abdominal operation. Fifteen had upper abdominal operations. They distinguished three types of cases according to the respiratory pathogens found.

1. Three cases showed no pneumococci at any time. The patients all manifested the minimum of postoperative pulmonary changes, called hypoventilation.

2. Six cases showed pneumococci or beta hemolytic streptococci constantly or intermittently but with no relationship to a pulmonary complication. A diagnosis of a pulmonary complication was made in each.

3. A group of 7 cases revealed the pneumococcus, or in one instance a mouse virulent alpha hemolytic streptococcus after operation coincidentally with pulmonary changes.

These authors believed that the postoperative changes in the physiology of respiration and circulation were related to the development of bronchitis, bronchopneumonia, and collapse to such an extent that they favored the bacterial invasion of the lower respiratory tract. Patients who had no respiratory pathogens in the pharynx had the least pulmonary changes, and those who harbored such organisms showed thoracic changes of varying degrees. Suttiff and Steele concluded that the pulmonary signs were the result of the presence of the organisms, and the severity of the

symptoms was proportional to the virulence of the organisms.

These studies indicate that the primary change following operation is hypoventilation and this permits bacterial invasion and growth.

In 13 of a series of 21 cases of postoperative pneumonia reported by Hinshaw and Moench (52) the pneumococcus appeared to be the causative organism. There were 2 cases of Type 6, and 1 each of Types 1, 3, 10, 13, 15, 16, 17, 20, 23, 24, and Group E. These authors stressed the point that although the types of pneumococci in postoperative pneumonia vary greatly sulfapyridine seems to be effective in all.

THE INCIDENCE OF POSTOPERATIVE PULMONARY COMPLICATIONS

There has been considerable discrepancy in the literature regarding the frequency of postoperative pulmonary complications. Cutler (34, 35) stated that they occurred after about 2 per cent of all operations, 4 per cent of all laparotomies, and 8 per cent of all upper abdominal operations. The mortality is said to be 0.6 per cent or 2 cases in every 300 (Editorial, *J. Am. M. Ass.*, 36). Bruan and Brill (19) found atelectasis in 4.8 per cent of their series. Soyder (89) reported an incidence of 1.9 per cent. Ellason and McLaughlin (37, 38) reported that from 1.5 to 3.5 per cent of all surgical cases developed pulmonary complications. King (62) reported 3.7 per cent, 5.2 per cent, and 6.8 per cent in various years, and emphasized the fact that the greater the interest in the condition and the more it was studied, the greater would be the number of cases diagnosed. Roventine and Taylor (86) reported 6 per cent minor and major pulmonary complications in a large series of cases. Suttiff and Steele (91) were able to demonstrate changes roentgenographically by physical examination, or by both methods in 60 per cent of a small series of cases. Nearly all of the patients had had upper abdominal operations. Beecher (9) showed collapse without symptoms in over 80 per cent of the patients subjected to abdominal operation which he studied. Suttiff and Steele suggest that most observers have reported only cases of maximum severity and have determined the incidence on this basis.

Brock (6) objects to the use of the term "massive collapse" because it has resulted in a lack of recognition of atelectasis of a patchy or lobular type unless the signs and symptoms are marked. Many times the signs may be minimal and cardiac, or mediastinal displacement cannot be demonstrated. It is in these cases particularly that roentgenographic examination is valuable.

For these reasons it would seem illogical to classify all cases into a single group but rather they should be separated into all gradations, including hypoventilation, bronchitis, atelectasis (lobar and lobular), and pneumonia.

In any event, diagnosis of these conditions depends largely on the "atelectasis consciousness" of the individuals who care for these patients. Sewall (86) has urged the profession to 'think atelectasis,' and as this idea becomes more prevalent the diagnosis will be made earlier in the course of the disease and therapeutic measures to correct it can be invoked. Thus the more serious complications may many times be prevented.

Burford (20) has stated that the problem of pulmonary complication following operation not on the abdomen in his experience has always been negligible. Males are said to be affected twice as frequently as females. This is due, presumably, to the fact that males are predominantly abdominal breathers and consequently abdominal operation results in greater damage to the respiratory apparatus in men than in women. Operations on the stomach and the biliary tract as well as on the spleen are followed by pulmonary complications in a very high percentage of cases. Splenectomy is said to produce lung complications in 25 per cent of the cases (Vogel, 4). Roventine and Taylor (80) observed that the seasonal incidence variation depends on the presence of respiratory infections and that the anesthetic agent *per se* exerted no marked influence. The anesthetic technique did seem to play a rôle. The duration of the operation and the operative procedure were likewise definite factors influencing the pulmonary morbidity. In operations lasting one half hour or less the incidence was 2.9 per cent and increased progressively for each half hour to 30 per cent for operations lasting from three to three and one half hours (Taylor, Bennett, and Waters, 93).

Schmidt and Winters (83) report the following figures on a very large series of cases:

MAJOR RESPIRATORY COMPLICATIONS

Anesthetic Agent	Cases	Per cent
Cyclopropane	10,044	1.10
Ether	4,402	2.37
Nitrous oxide	2,338	1.02
Ethylene	1,044	1.05
Spinal	1,340	1.34
Type of Operation	Cases	Per cent
Orthopedic (except spine and amputations)	3,241	0.24
Upper abdominal laparotomies	1,131	7.43
Lower abdominal laparotomies	2,762	2.67
Gynecological and Obstetrical (except laparotomies)	3,148	0.16

CLINICAL PICTURE

1. **Bronchitis** This is a common complication after operation, but frequently progresses to more serious complications. Consequently the recorded incidence is low since many of these cases are reported as atelectasis or pneumonia. King (62) states that the incidence is 3 per cent. The patient develops a simple productive cough with fever but with no abnormal physical signs beyond a few rales. Resolution occurs rapidly with no evidence of permanent damage. Starr (90) believes it is due to a circulatory imbalance of the lung and if encountered in the normal patient it infers incorrectly administered anesthesia. In patients suffering from precedent respiratory infection, debility, or sepsis, it may occur following even well administered anesthesia. The danger lies in allowing bronchitis to proceed to a more serious respiratory complication.

2. **"Collapse without symptoms"** This condition has been described by Beecher (9) and discussed by Henderson (49). Suthiff and Steele (91) have referred to it as "hypoventilation." Beecher found it in 83.0 per cent of a series of laparotomies. He believes that this is a diffuse and partial collapse rather than a local and complete collapse. There was no evidence of collapse on physical or x-ray examination, yet measurements of the sub-total air showed a significant and consistent decrease after laparotomy. He states that some of the usual postoperative manifestations may be due at least in part to its development. These manifestations are principally a rise in pulse and temperature and the typical shallow, rapid respirations.

3. **Atelectasis** The signs and symptoms of atelectasis usually appear within the first forty-eight hours after operation but may be deferred until the fourth or fifth day. Moore (71) stated that any patient developing a sudden or unexpected elevation of temperature or respiratory rate after operation should be suspected of having atelectasis until proved otherwise. There is also a tachycardia early which Starr (90) considers an important diagnostic factor. The earlier the onset of symptoms the more serious the subsequent features and the more rapid the march of symptoms are likely to be (Starr, 90). Also, the longer a rise in temperature and pulse is delayed after operation the less likely is the cause to be simple atelectasis (Brock, 16). Dyspnea and cyanosis may or may not be prominent. Cough with expectoration of thick tenacious sputum, which is never blood tinged, may be present according to the patient's ability to cough effectively. Brock has emphasized the diagnostic importance of the

cough which he has described as "fruity." It is due to the "gargling" of thick mucopurulent material in the trachea and large bronchi, and the typical, frequent, restrained ineffective coughing of the patient.

The physical signs in the early stages are notoriously inconstant and variable. Transient physical signs are found in the chest after nearly all upper abdominal operations and a diagnosis of atelectasis is usually not warranted on the basis of the physical signs alone. In the typical case in which collapse involves an area sufficient to produce a mediastinal shift the findings are definite. The expansion of the affected side is limited or absent while that of the opposite side is increased. The apex beat is displaced toward the collapsed side. Bye (21) regards this as the most important physical sign. It will not occur if bilateral collapse is present, or if the mediastinum is fixed. Zukschwerdt and Lexius (106) also emphasize the shift of the mediastinum as a diagnostic point and an indication for urgent therapy by means of artificial pneumothorax. Early there is often hyperresonance over the affected lung, but later dullness is found. The breath tones are diminished or absent and no rales may be heard in the beginning but later the breath sounds become tubular or amphoric and moist crackling or bubbling rales may be heard.

Christopher and Shaffer (13) as well as many other authors have stressed the importance of the x ray examination because of the difficulty of differentiating between collapse and pneumonia by physical signs alone. Roentgenographically there is elevation of the diaphragm and narrowing of the chest on the affected side. An increased obliquity of the ribs and decrease in the size of the intercostal spaces can usually be demonstrated. The trachea, heart and mediastinum are displaced toward the affected side, and the involved lung tissue shows an increase in density. Warner and Graham (10) as well as Anspach (3) have emphasized the diagnostic value of a triangular shadow with associated displacement of the surrounding structures toward it at the base of the lung as a sign of collapse. The development of bronchiectasis in the collapsed area has been demonstrated when subsequent expansion has not taken place.

4. Postoperative pneumonia. The involvement may be lobar or lobar but the clinical features are usually those of a severe lobar pneumonia. The temperature remains high, the pulse rises and the respiratory rate may be markedly elevated. The skin is hot and as a rule sweating is profuse. Cyanosis and cough with expectoration

of large quantities of mucopurulent sputum are quite constant features. Pneumococci can usually be isolated from the sputum. Delirium frequently occurs. The signs in the chest are those of consolidation and vary with the stages of the disease. Bergh (11) states that rales appear early in pneumonia and late in atelectasis. The x ray changes are usually diagnostic.

Lobar pneumonia has been frequently diagnosed postoperatively when only massive atelectasis was present (Brook 16). Hypostatic pneumonia is usually a terminal event, but retention of secretions, stagnation, and atelectasis may play an important part in its development.

PRE-OPERATIVE, OPERATIVE AND POSTOPERATIVE CONSIDERATIONS

Certain precautions taken to prevent the occurrence of postoperative pulmonary complications are particularly effective as can be logically assumed from considering the foregoing paragraphs on predisposing conditions. Holman (55) has emphasized the fact that a few days spent in preparation for operation usually means damage postoperatively. The nutritional factors which previously have been given insufficient attention are the proper administration of such carbohydrates, proteins, vitamins, and blood. The patient frequently has been on an inadequate diet for an extended period because of his disease and his reserves of these substances have been greatly depleted. Poor wound healing due to decrease of serum proteins (Ravdin, et al 94), Vitamin C (Lanman and Ingalls, 63) may lead to wound disruption when associated with a pulmonary complication, and, or infrequently may result in a fatal outcome. In an otherwise favorable case Holman points out that the reserves of Vitamins A, C and D are particularly important in the patient who is subjected to a surgical procedure.

The presence of an upper respiratory infection is an undoubted contraindication to elective operation. Holman indicates that a patient admitted to a hospital and operated upon the following day may be developing such an infection, but the signs and symptoms do not become evident until after the operation. Then a limiting pulmonary complication appears when the factors of hyperventilation, decreased ability to cough and irritation of the respiratory passages by the anesthetic are added. This is a strong argument in favor of a period of hospitalization of two or three days before surgery is carried out particularly in cases which are likely to develop pulmonary complications postoperatively.

Chronic oral sepsis or oronasal infection are likewise important contributing factors to postoperative pulmonary complications and an attempt should be made to place the patient in the best possible condition as regards these infections before surgery is carried out. When chronic pulmonary disease exists every means should be taken to rid the trichobronchial tree of exudate before operation by means of postural drainage or bronchoscopy if necessary (Holman 52).

A careful study of the cardiovascular status of the patient should be carried out and if signs or symptoms of cardiac failure are uncovered digitalization should be completed before operation. The stomach should be emptied by tube before gastric operations to obviate regurgitation and aspiration of its contents while the patient is under anesthesia (Balfour and Gray, 5).

Taylor, Bennett, and Waters (93) have emphasized the close correlation between the preoperative grading of the patient according to the operative risk and the development of pulmonary complications. Brown (18) has discussed three simple methods of evaluating the operative risk. These consist of (1) the breath holding test, (2) the determination of the pressure ratio (Moot's rule), and (3) the determination of the energy index. These studies provide a valuable guide in foretelling the probabilities of complications and prepare the staff to undertake prophylactic measures immediately after operation, and to be on the lookout for their development.

The role of excessive sedation before operation as a cause of pulmonary complications has been repeatedly stressed by various authors (Holman [53], Waters, 103). These drugs are respiratory depressants and consequently should be used with extreme care. Burford (20) suggests that relatively heavier premedication is indicated in the male who is twice as susceptible to pulmonary complications as the female. He advises that the patient be almost asleep when brought to the operating room, and is nearly insusceptible to the stimuli of his surroundings as possible, his metabolic rate should be greatly depressed. The medication should be given far enough in advance to have reached its maximum effect before the anesthetic is started and to be wearing off as the anesthetic progresses. This method of premedication is designed particularly for use with cyclopropane.

It has been held by some that the anesthetic agents play a relatively insignificant rôle in the development of pulmonary complications. Burford points out, however, that the anesthetic affects the results directly through the degree of

damage or excessive irritation produced in the respiratory tract and through the degree of depression produced by the anesthetic itself because of excessive relaxation and prolonged action. Luzzier (41) reported pulmonary complications in 5.66 per cent of 300 patients given spinal anesthesia, and 0.9 per cent of a similar series given general anesthesia. Circulatory collapse was more frequent following spinal anesthesia. Schmidt and Waters (84) (see previous table) reported a lower incidence of pulmonary complications following gas anesthesia chiefly cyclopropane, than after other types. Broel has related Ogilvie's experience with local anesthesia in gastric surgery but in this country this type of anesthesia has not been used widely in abdominal operations.

The danger of massive collapse during or following anesthesia with the rapidly absorbed gases has been pointed out by Jones and Burford (59). They cited 4 cases 3 of which were fatal and came to autopsy. In each instance massive atelectasis not associated with bronchial obstruction was the only demonstrable pathological finding. These authors therefore suggest diluting the anesthetic mixture with either of the relatively inert and slowly absorbed gases helium or hydrogen.

Since the loss of tonus is believed to be one of the prime factors in the development of pulmonary complications (Henderson, 40), cyclopropane appears to have advantages over other anesthetics. It produces a degree of muscular relaxation which can only rarely be exceeded (Burford, 20). The degree of relaxation may be insufficient to satisfy all surgeons, but when it is realized that relaxation is secured at the risk of serious complications, certainly concessions will have to be made, especially in the cases of those individuals who are prone to have respiratory trouble postoperatively.

The technique of administration of the anesthetic, as well as the ability, training and experience of the anesthetist, bears a definite relationship to the development of pulmonary complications (Rovenstine and Taylor, 80). A stormy anesthesia predisposes to pulmonary atelectasis (Christopher and Shaffer, 25), and a patient who continues to fight his anesthetic will have to fight for his convalescence (Harrison and McLaughlin, 37). These observations are in keeping with those of Van Allen, Lindskog, and Richter (97, 98), who report that "straining respiration," as in coughing, moaning, grunting, is necessary to produce atelectasis. Starr (90) states that hyperextension of the head by extending the occiput and lifting the point of the chin provides a more satisfactory airway than forcing the jaw forward. Aspiration

of secretions in the bronchial tree during anesthesia together with the use of the Trendelenburg position is likewise an important consideration in maintaining the patency of the air passages and preventing the entrance of material into them.

The importance of the depth and the duration of the anesthesia has already been referred to but they cannot be over-stressed as pulmonary complications occur in direct relationship to them.

Cutler (33) who has long advocated the embolic theory of the development of pulmonary complications, observed that surgeons who were rough allowed dissection of the tissues, and took very little care of hemostasis experienced a higher percentage of complications than their more meticulous colleagues. Attention to detail here as in all other aspects of surgery is all important regardless of the theory adhered to.

If our concept of the relationship of wound pain muscle spasm, and hypoventilation are acceptable it would seem plausible to assume that a large, widely traumatized, poorly closed incision in the upper abdomen would cause greater inhibition of breathing and coughing than would a smaller properly closed incision in the same region. Jones and McClure (58) believed that the use of the transverse incision in the upper abdomen resulted in a decrease in the number of postoperative pulmonary complications. Sloan (83) Singleton (87) and others have expressed a similar belief. Brock (16) states that the transverse incision which tends to close when the abdominal muscles contract is preferable to a longitudinal one which tends to pull open. No satisfactory statistical studies have been noted in the literature which confirm this impression. The midline supra umbilical incision has proved very satisfactory from this viewpoint in Ogilvie's experience. Wound sepsis appears to be a significant factor in the development of postoperative pulmonary complications (King, 62). Capelle (32) believes that peritoneal irritation or inflammation results in only minimal degrees of inhibition of respiration and that the determining factor is voluntary and reflex spasm due to wound pain. He was able to minimize spasm by the use of a continuous injection of a local anesthetic into the wound and thus restore practically normal abdominal and thoracic excursion as well as vital capacity.

The abdominal dressing should be applied so that it gives adequate support to the wound but causes no impairment of tidal exchange (Beck, 7). Powers (79) found but slight reduction of the vital capacity when tight binders or adhesive strapping were applied. This averaged about 7 per

cent, and, although he ascribed little significance to this change it would seem that any further reduction of the already greatly impaired respiratory exchange would increase the incidence of pulmonary complications.

The position of the patient during the immediate postoperative period should be changed at frequent intervals (at least every hour) and the foot of the bed should be elevated to secure postural drainage of the lungs as well as to aid the return of blood to the right heart. Gray (45) suggests the use of the Trendelenburg position for the first twenty-four hours after operation in order to prevent aspiration of mucus or vomitus while the patient is abnormally quiet and before the cough reflex has returned. Burford and others prefer the lateral position which allows for better drainage and freedom for coughing and vomiting. Beck states that the head of the patient should be about a foot lower than his feet and should be turned so that the mouth touches the sheet.

It is generally acknowledged that large doses of sedative or narcotics should be avoided both before and after the operation. These drugs, particularly morphine depress the cough reflex and tidal exchange as well as the general activity of the patient. Many authors (Brock, 16; Haight, 47; Christopher and Shaffer, 25; Beck, 7) believe that small doses of morphine should be used to allay pain, and allow for effective coughing and hypoventilation but emphasize that it should not be used in doses sufficient to depress the cough reflex. Capelle (32) was able to demonstrate an augmentation of the vital capacity amounting to from 3 to 5 per cent postoperatively after the administration of morphine.

The most satisfactory prophylactic measures are to encourage the patient to hypoventilate and cough effectively and to change his position at least every hour. A great many articles regarding the merits of carbon dioxide administered routinely to induce hypoventilation of the lung have appeared in the literature. Beck (7) has listed 30 authors who favor its administration and 9 who could demonstrate no decreased morbidity following its use. Beecher (8) found essentially the same changes in the physiology of respiration whether carbon dioxide was used or not. Powers (79) demonstrated less fall in the vital capacity when carbon dioxide was used postoperatively. Henderson (90) states that in addition to increasing the volume of breathing by stimulating the respiratory center it induces increased tone in the thoracic muscles, diaphragm, and to some degree in all the muscles of the body. Beck (7) concluded after careful review of the literature

that hyperventilation of the lungs by use of carbon dioxide inhalations should be continued as a routine measure Holman (53), however, stated that he felt that voluntary hyperventilation would do as much good as carbon dioxide inhalations.

Brock (16) has suggested that continued use of carbon-dioxide inhalations after operation might be harmful. He reasons that the forceful inspiratory efforts which the gas induces may serve to suck secretions even deeper into the lung. Also he points out that the administration of carbon dioxide may be most exhausting to the patient.

Most authors agree with Jackson's (56) contention that atropine should not be used to dry up secretions in the respiratory tract postoperatively because it tends to increase their viscosity and render their removal by cough more difficult. Instead, ammonium chloride or potassium iodide should be administered in small doses for their expectorant action.

It is important to encourage a certain amount of activity on the part of the patient to aid the return circulation and maintain tonus, but equally important is the forceful stressing of the necessity to hyperventilate, cough, and expectorate material in the bronchial tree. Brock (16) has said, "When the vice of immobility and the virtue of activity are pointed out to the patient, active co operation usually follows."

THE TREATMENT OF ATELECTASIS

Once atelectasis has developed all efforts should be made to evacuate the bronchial exudate and secure re-expansion of the collapsed area. This demands vigorous treatment which must be instituted promptly lest such complication as pneumonia, pulmonary abscess, or pulmonary gangrene develops. In the early stages of collapse the prognosis is very favorable if proper treatment is given.

The greatest factor in obtaining free expectoration is active effort on the part of the patient accompanied by changes in posture (Brock, 16). The lateral position with the foot of the bed elevated is the most effective position for securing drainage of the bronchial tree. Haight (47) has stated, however, that some patients cough more effectively in the semi-Fowler position and therefore, the position best suited to the patient should be employed.

Moore (71) has described a method of treatment which has been particularly effective in his experience. He applies a tight abdominal binder and places the patient in the lateral position with the involved lung uppermost and the foot of the bed elevated. The physician stands behind

the patient and both he and the patient place one hand over the incision to give support to the abdominal wall. The patient is then urged to hyperventilate and cough. Vigorous percussion over the affected lung and carbon dioxide inhalations are used if evacuation is not satisfactory. He states that the patient will frequently volunteer the information that "That's all" when the bronchial tree has been emptied. Carbon-dioxide inhalations, steam inhalations, and ammonium chloride or potassium iodide should be used in conjunction with this therapy and the treatment may be repeated as indicated.

Haight (47) has reported successful results with intratracheal suction in postoperative atelectasis. The object of this procedure is to evacuate bronchial secretions when the cough remains wet and unproductive, either because the patient is unable or unwilling to co-operate. The method can be used interchangeably with bronchoscopic aspiration or can be used in preference as it is less strenuous on the patient and probably less traumatic. If necessary intratracheal suction may be repeated at intervals of from four to six hours.

Haight (47) recommends an ordinary No. 16 French soft rubber urethral catheter connected with a suction machine, preferably with an interrupter in the circuit. The catheter is introduced through the nares and into the larynx and trachea during the expiratory phase of cough or during the deep inspiration which follows it. By changing the position of the patient and manipulating the tube the different portions of the tracheo-bronchial tree can be cleared of secretions.

Although Elliott and Dingley (39) in 1914 suggested the use of artificial pneumothorax in the treatment of pulmonary collapse it was apparently not tried until Habliston (46) in 1928 reported satisfactory results in 2 cases of collapse, neither of which occurred postoperatively. Subsequently Moorman (72), Schindler and Gnagi (82), and Zukschwerdt and Lezius (106) have reported striking results with this method of treatment. The last authors believe artificial pneumothorax has not been given the recognition it deserves as in the 14 cases which they treated, cure resulted as if by magic.

They state that the pressure changes resulting from massive atelectasis bear chiefly on the delicate veins entering the right heart and produce a bending and kinking of these vessels. The unilateral low pressure draws blood away from the heart and causes a decreased venous outflow as well as a congestion of non-arterialized blood on the side of the collapse. Stasis and exudation into the alveoli then follow.

Pneumothorax is said to correct immediately many of these pressure alterations, place the diseased lung at rest frequently dislodge the obstructing plug or plugs, and decrease the area of collapse and the volume of blood flowing through it (Schindler and Gnagi, 82). As a rule from 200 to 400 c.cm. of air are used, following which the patient begins to cough and expectorate. The dyspnea and sensation of oppression clear rapidly and the physical and x-ray signs of collapse soon disappear (Zukachwerdt and Lexius, 106).

Bronchoscopic aspiration in postoperative atelectasis was first reported by Jackson and Lee (37) and this method has been repeatedly used with gratifying results. Haight (47) states that this method of treatment is preferable to intra-tracheal suction when a single aspiration will probably be sufficient when complete evacuation of the secretions is required, or when the application of adrenalin or cocaine to the edematous mucosa is indicated.

Zukachwerdt and Lexius (106) claim that this method of treatment is too risky and they prefer artificial pneumothorax. Others note that bronchoscopy should be resorted to only when all other methods of treatment fail, while some authors believe early bronchoscopic aspiration should be carried out especially when adequate facilities and personnel are available. Tucker (96) states that if the usual methods do not relieve the patient or if he is urgently dyspneic, bronchoscopy should be done. Immediate bronchoscopic aspiration is usually indicated when bilateral collapse is present.

Capelle (22) reports the use of novocaine anesthesia to relieve wound pain and spasm and facilitate both hyperventilation and cough. He believes this to be an effective prophylactic and therapeutic measure in postoperative atelectasis. The writer (44) has observed striking results from paravertebral anesthesia in the treatment of this condition.

Schwab (84) used a quinine and gualacol preparation in the treatment of a series of 60 cases with pulmonary complications. He believed the quinine reduced the inflammation of the respiratory membranes and the gualacol aided materially in the elimination of bronchial secretions. Moraldi (73) reported good results, both therapeutic and prophylactic from a quinine and calcium preparation.

THE TREATMENT OF POSTOPERATIVE PNEUMONIA

The treatment of postoperative, as well as primary pneumonia has been much more promising since the advent of sulfapyridine. The prog-

nosis is usually grave however because this condition is so often added to the troubles of an already seriously ill patient. The non-specific measures such as oxygen therapy hyperventilation with carbon dioxide and intra-venous administration of fluids are to be instituted as indicated. The sputum should be typed promptly and specific serum administered when available. This may be given in conjunction with sulfapyridine as recommended in primary pneumonia. In any case sulfapyridine should be started immediately once the diagnosis of pneumonia has been established.

Hinschaw and Moersch (52) report 21 cases of postoperative pneumonia treated with sulfapyridine with only 1 death. They usually give 1 gm. by mouth every four hours, day and night, but give double this amount for the first and frequently the second dose. No serious results attributable to the drug were noted. The oral route is the only one by which the drug can be given at present which necessarily limits its field of usefulness in postoperative patients to some extent.

Hinschaw (51) has worked out a set of rules to govern the use of sulfapyridine in his practice:

1. Adequate dosage is essential to treatment.

The dosage must be well distributed throughout the day and night.

3. The occurrence of nausea or even vomiting should not dissuade the physician from continuation of needed therapy.

4. Results are prompt. The drug may be abandoned if real benefit cannot be demonstrated on the chart within from forty-eight to seventy-two hours.

5. For the most part, sulfapyridine should be used only for patients who are seriously ill.

SUMMARY AND CONCLUSIONS

The importance of postoperative hypoventilation as a predisposing cause of pulmonary complications seems well established. Hypoventilation appears to be due chiefly to pain and reflex spasm caused by a wound in the abdominal wall. Decreased tonus of the respiratory muscles, as well as other muscles, resulting from anesthesia, operative trauma, or narcosis, may also play a significant rôle. Bronchial secretions which may be increased or thickened by various factors are retained because the normal mechanisms for removal have been depressed. These mechanisms are cough, hyperventilation, ciliary action of the bronchial epithelium and normal postural changes. The retained secretions frequently cause lobular or lobar obstruction and the absorption of air from the blocked segment very soon results in atelectasis.

This condition can usually be avoided if proper prophylactic measures are carried out. These consist of active hyperventilation and cough on the part of the patient, frequent changes in position, and avoidance of excessive narcosis. Carbon-dioxide inhalations may assist in securing hyperventilation and effective coughing.

Bacteria contained in the secretions rapidly invade the collapsed segment and set up a pneumonia unless measures are promptly invoked to remove the obstructing mucus. The organisms usually present are derived from the upper respiratory passages, and are most frequently pneumococci.

The measures which have been found to be most effective in combating postoperative atelectasis are similar to the prophylactic measures, namely, cough, hyperventilation, postural drainage, frequent changes in position, and vigorous percussion over the affected lobe. In addition, intratracheal suction and bronchoscopic aspiration may be utilized if these measures fail. Artificial pneumothorax may be an effective therapeutic measure in massive atelectasis, but as yet has not been widely accepted. Likewise, the value of local anesthesia for relief of wound pain as an adjunct to more effective coughing and hyperventilation remains to be more completely studied.

If the diagnosis of pneumonia in the atelectatic lung is established, sulfapyridine therapy should be instituted immediately. It is probable that the use of this drug in properly selected and controlled cases will result in an appreciable decrease in the mortality from postoperative pneumonia.

Attention to detail during the pre-operative, operative, and postoperative periods should be our watchword in the care of the surgical patient, and only by this means can we expect to decrease the incidence and the mortality of postoperative pulmonary complications.

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SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE, POSTOPERATIVE TREATMENT

Maioli, M Evaluation of the Circulatory Efficiency in Surgical Practice (La valutazione dell'efficienza circolatoria nella pratica chirurgica) *Clin chir*, 1940, 16 51

Maioli states that one of the principal factors in deciding on a surgical intervention is the evaluation of the resistance of the circulatory apparatus, because the operative traumatism subjects the heart and the vascular system to a strenuous test. Consequently, the surgeon will have to study the functional and anatomical condition of the heart and of the vessels and decide whether or not the probabilities are in favor of the patient's enduring the operation and whether or not the circulatory system should be prepared for the surgical traumatism in case of operation. The surgeon should rely on his own judgment based on numerous observations, and not on the judgment of the internist who attaches more importance to anatomical than to functional conditions, and is inclined to excess of optimism or pessimism.

The question of whether the circulatory system will be submitted to a strain by the intended intervention is easily answered. The selection of the anesthetic is motivated by the nature of the intervention and by the cardiac, hepatic, and renal condition of the patient. However, the question which directly involves the responsibility of the surgeon is what reaction the operation will cause in the circulatory system. Numerous tests have been proposed, but all are open to some objection. Therefore, the surgeon must consider the results of the various tests as objective data and use his clinical intuition analytically and synthetically to draw conclusions.

First, a careful examination of the circulatory apparatus of the patient at rest is indicated in all cases to establish the anatomical diagnosis. If the apparatus is found to be normal, the arterial pressure before and after some effort is determined, and possibly a test of the vagosympathetic equilibrium is made. If the apparatus is found to be seriously damaged, abstention from surgical intervention is indicated except in urgent cases. Intermediate cases require further study. The response of the apparatus to the orthostatic position and the behavior of the pulse after an effort in the erect posture must be observed. The time taken by the pulse to return to normal increases proportionately to the decrease in reserve power of the heart, and disturbances of the cardiac rhythm during the tachycardia are to be regarded as unfavorable signs. In this case, the behavior of the arterial pressure in the presence of an effort must be investigated.

As a general rule, it may be taken for granted that a patient having an arterial pressure of more than 150 mm has hypertension and that one having a

pressure of less than 120 mm has hypotension. Hypertension, accompanied by marked arteriosclerosis and renal or myocardial lesions, contraindicates a serious operation. Hypotension facilitates the appearance of postoperative collapse, but its importance depends on its cause and the decision of the intervention must be subordinated to the latter. In the evaluation of the circulatory efficiency, the behavior of the arterial pressure under effort is valuable: the differential pressure increases in the normal subject, but it decreases when the effort exceeds the capacity of circulatory adaptation of the individual. Bad response, especially if associated with an unfavorable test of the pulse frequency, serves as warning that the surgical intervention may overtax the circulatory system and lead to disaster.

Another test is based on the volume of the heart in the presence of increased demands and requires the aid of roentgen examination, the effort, whether caused by exercise or the injection of adrenaline, produces passive dilatation in the miopragic heart. None of these tests has an absolute value, they reveal the degree of excitability of the heart and of tonicity of the vascular apparatus, as compared to normal: the excitability of the heart is very important for the evaluation of the circulatory efficiency, and one must know the anatomical diagnosis to determine the operative prognosis.

The circulatory apparatus may be prepared by a rest cure or by medication. Digitalis and rest are indicated in functional disturbance based on slight reactivity of the heart to effort, especially in patients who are leading a strenuous life; digitalis will give poor or no results in case of manifest circulatory insufficiency in patients who have led a restful life. In some patients, a sedative and antithyroid treatment, associated with reconstituent therapy, is needed. Lability of the vasomotor tonus requires adrenaline and strychnine. Rebellious hyperthyroidism offers great danger for narcosis and intervention. The rhythm and the quantity of urinary elimination may constitute a good test of circulatory function, but are not of absolute value. Electrocardiographic examination belongs to the province of the specialist, and his conclusions are usually accepted without discussion. Nevertheless, the surgeon must base his judgment on clinical data collected personally so as to enable him to do without special investigations when they are unavailable, or to control them eventually.

RICHARD KEMEL, M D

VanNieuwenhuizen, C L C The Venous Blood Pressure After Performance of Work, a Functional Test of the Circulation (Der venöse Blutdruck nach Arbeitsleistung, eine Funktionsprüfung der Zirkulation) *Acta med Scand*, 1940, 103 171

The author proceeded from the fact, which has been known for a long time, that the venous blood

supply is a determining factor with very definite limits for the function of the heart and, also, that the body endeavours to maintain the venous blood pressure as long as possible until the blood reaches the heart. He, therefore, investigated the effect of bodily exertion upon the course of the venous blood pressure. For this purpose two simple and daily applicable methods were combined, namely the direct method of Moritz Tabora for the determination of the venous blood pressure and the method in which the bodily exertion is produced by the patient in the living post recording by his legs fifteen times. The performance of work has the advantage that the zero point of the measurement of the blood pressure remains unchanged and that, furthermore, this work designates the same performance for every patient. After this exertion, the course of the venous blood pressure was followed for the duration of ten minutes (first 15 and 3 seconds, and after 3, 4, 5, 6, 7, 8, 9, and 10 minutes). In normal persons the venous blood pressure returned to the resting level as early as after fifteen seconds, it remains at this level, or it sinks to a maximum of 15 mm. of water below the resting level in juvenile persons. This resting level lies between 3 and 40 mm. of water in normal persons. Other investigators obtained the same result in animal experiments and after the injection of greater amounts of fluid in normal persons. Variations from this course may therefore, be considered as pathological.

The following investigations were made:

The venous blood pressure was taken after mechanical as well as before and after bodily exertion, and it was found that after bodily exertion the venous blood pressure showed a curve that is entirely above the resting value.

In cases of valvular diseases in arterial hypertension, in muscular fibrillation, and also in valvular disturbances the latter combined with myocardial injury, hyperthyroidism, and in cor pulmonale the venous blood pressure was determined before and after bodily exertion. The acquired curves may be divided into 4 types in agreement with the severity of the symptoms and, therefore, they possess diagnostic significance. In addition, the curves give an insight into the mode of origin and the course of the decompensation.

Type 1. The venous blood pressure is resting normal or somewhat above the normal. After performance of work the results curve which fluctuates around the region of the resting level. This curve is found in healthy persons but also in patients with hypertension without decompensation and with uric acid fibrillation or frequently regular and low uric acid frequency.

Type 2. The venous blood pressure is normal or lowered. After bodily exertion there results a lower curve which lasts for ten minutes or even longer and the pressure is stronger than in normal persons. This course may be considered an attempt at compensation so as not to allow the terminal pressure in front of the right ventricle to rise with the aid of the

depot. Such a curve denotes beginning decompensation which, because of the compensatory mechanism demonstrable on the basis of the investigations, has not yet led to the development of symptoms of stasis. Usually drainage effort results.

Type 3. In spite of the compensation, the venous blood pressure has again risen in the resting state to a high normal or somewhat higher level. Following exertion fast results, which, after some time, usually from three to five minutes, is again compensated or overcompensated. The venous blood pressure then usually sinks markedly below the resting level. This type is usually associated with clinical signs of decompensation, such as dropsy and swelling of the liver (depot of action of the liver) oedema, and sometimes rapid pulse and slight edema.

Type 4. This type is found in pronounced cases of cardiac decompensation (dyspnoea, rest edema, liver swelling, swollen jugular veins, a rapid pulse). The venous blood pressure is increased even in the resting state and marked as it appears after exertion which cannot or can barely be compensated for within ten minutes.

This course of the venous blood pressure after performance of work also shows clearly the determinations heretofore, which with few exceptions are all ways carried out in the resting state, were so unsatisfactory. In a distinct decompensation the venous blood pressure may still be normal (Types 1, 2, and 3). The various causes of cardiac decompensation above, although they may easily be grouped in this classification, peculiarities specific for each type which have been described. The determination of the venous blood pressure after performance of work is a simple and reliable method for the recognition of decompensation of the heart. In addition it affords insight into the nature of the origin and treatment of the circulatory disturbances in the venous system resulting from this decompensation.

LOUIS V.

M.D.

Jones, R. J. The Management of Old Contractures of the Hand Resulting from Third-Degree Burns. *Surgery* 40, 7, 1914.

Contractures of the hand and digits result from burns are common and these deformities often can be corrected by suitable operative measures with subsequent improvement in the function of the hand. Even if patient present no actual problem but it is important to estimate the depth of the scar attachment and the possible distortion of the deeper structures before the method of repair is chosen.

The patient fall into three groups. The first are those in which scars on the palmar surface of the digits and often on the palm have caused black flexor contractures of the fingers. These can often be relieved by the interposition of flaps formed by incision made to give the incision which placed the edge of the contracture and flaps it.

The second group of patients present broad scars which are unattached to the deeper structures of the hand. These are best treated by excision of the scar, but a protective layer of fat should be left over the nerves and tendons. This defect is covered with a full-thickness graft on the palm, but a thick, split graft may be used if the dorsum of the hand is involved.

The third group of patients have a scar which extends from the skin to the muscles, tendons, or joints of the hand. This fibrous tissue should be stretched as far as possible pre-operatively by physiotherapy. After excision of the scar it is necessary that an adequate fat pad is interposed between the skin and deeper structures. For this method a previously prepared pedicle flap is usually necessary.

In the management of contractures proper physiotherapy and splinting with the use of elastic traction is of great assistance in obtaining return of function.

Photographs and illustrations demonstrating the type, treatment, and results of the various groups of contractures of the hand are shown.

HARVEY S. ALLEN, M.D.

Levinson, S. O., Neuwelt, F., Necheles, H., and Others. Human Serum as a Blood Substitute in the Treatment of Hemorrhage and Shock. *J. Am. Med. Ass.*, 1940, 114: 455.

In the treatment of hemorrhage and shock, transfusion with whole blood is desirable, but the securing, matching, and the performance of the Kahn and similar tests entail considerable unavoidable delay. Human serum, on the other hand, may be collected at leisure, stored for an indefinite period, and used immediately when a situation demands, without cross matching or fear of any reaction. Loss of erythrocytes is seldom a vital factor in severe hemorrhage. The sudden and marked diminution in the circulating blood volume is of grave significance, however, because this oligemia leads to rapid development of secondary shock.

Experiments were performed on dogs anesthetized with pentobarbital sodium, in which the blood pressure was recorded in the usual way. A femoral artery was prepared for bleeding and a femoral vein for infusions. After a control blood pressure had been recorded, the animal was bled rapidly until its blood pressure fell to shock level (systolic pressure from 40 to 60 mm. of mercury). The blood pressure was maintained at shock level for from ten to twenty minutes before an infusion of either saline solution or dog serum was given. The amount of fluid administered varied from one fourth to several times the amount of blood removed. Such experiments demonstrated that immediate infusion with saline solution produces a moderate degree of recovery, which, however, is less marked than that following serum infusion. Delay in administering fluids, on the other hand, caused a loss of effectiveness of the saline solution, the influence of which on blood pressure was only temporary, in contrast with the sustained effect of serum.

Somewhat similar experiments were done, in which a state of post-hemorrhage shock was brought on by a single massive hemorrhage. The animals were left in this condition for two hours so that increased capillary permeability and secondary shock might develop. The animals were then transfused with various fluids. It was found that some recovered to a varying degree in the two-hour period, while others remained in shock, and therefore transfusions with saline solution, serum, or blood gave varying and inconsistent results. It is worth noting that those dogs having the highest blood pressure at the conclusion of the experiment had received either blood or serum. Another interesting feature was that the blood proteins remained at normal levels following the serum infusions, whereas they showed considerable diminution after saline infusion. Experiments with long-continued graded bleedings also demonstrated the superiority of serum over saline solution.

Hottelink has shown that the immediate infusion of large quantities of normal saline solution in primary shock is as beneficial in saving the lives of dogs as any other blood substitute. In secondary shock, however, saline solution is no longer a life-saving fluid because of the increased capillary permeability.

The authors conclude that serum overcomes all the effects of hemorrhage in dogs except the loss of red cells. They anticipate the extensive use of human serum in war surgery. AUGUST JONAS, JR., M.D.

Strumia, M. M., Wagner, J. A., and Monaghan, J. F. The Treatment of Secondary Shock. *J. Am. Med. Ass.*, 1940, 114: 1337.

Shock is the result of a decrease in the volume of circulating blood. The ideal therapeutic agent to combat this condition is one which brings about a rapid and permanent increase in the blood volume. Whole blood transfusions, gum acacia, and intravenous infusions of sodium chloride and dextrose solutions have been used clinically to combat shock, but these measures are often inadequate and may even be dangerous. Experimentally, lyophilic serum and plasma has been used successfully to overcome shock. Strumia and his coworkers believe that citrated plasma has many advantages over other agents in the treatment of shock. They have used it successfully in a number of clinical cases, 10 of which are presented and discussed in detail.

The plasma should be prepared in the following manner:

Proportionally, 500 c.c. of blood are mixed with 100 c.c. of a solution containing 2 per cent sodium citrate in physiological normal saline solution. The mixture is centrifuged and the plasma separated by suction. The plasma may be used fresh or stored at 4° C. after the addition of 1:10,000 merthiolate solution. No cross matching is necessary, but each batch is tested serologically. At the Bryn Mawr Hospital, where this report originated, plasma is collected as a by-product at the end of five days from stored whole blood. Plasma may be preserved

for long periods of time by drying from the frozen state the so-called "lyophile" or cryochem process.

According to the authors, plasma has distinct advantages over other shock combating agents. These advantages are:

1. Over crystalloids. Plasma does not leave the blood stream as do the crystalloids (saline and dextrose).

2. Over gum acacia. It does not produce severe and even fatal reactions.

3. Over serum. Plasma has greater yield and does not cause reactions.

4. Over whole blood. No typing or cross matching is necessary. Plasma is free from reactions and very large and repeated doses may be given. Plasma can be kept much longer than whole blood, and it can be transported without affecting it in any way. Plasma does not add to the concentration of erythrocytes, decided advantage in severe burn cases. Plasma is always ready to be used for an emergency and a plasma bank is considerably simpler to operate than blood bank.

Finally the authors point out that plasma is an ideal agent for the treatment of shock under war conditions. LUTHER H. WOLFE, M.D.

Hall, C. G. Aspiration Pneumonitis. An Obstetrical Hazard. *J. Am. M. Ass.* 240, 4 1935.

The writer reports a case, in October 1937 of aspiration pneumonitis occurring in primipara, thirty three years old, at full term. The patient entered the hospital at 3:30 A.M. in the first stage of labor. She was given a mixture of scopolamine, morphine, and castine (H.M.C.) at 3:00 A.M. so that she could secure some sleep. The following forenoon the labor pains were weak and irregular. Rectal examination showed only 1 cm. of dilatation. At 2:00 P.M. she was given further medication consisting of sodium barbital (7½ gr. by mouth) and scopolamine (1/50 gr. by hypodermic). At 3:55 P.M. 2 minims of solution of extract from the posterior lobe of the pituitary gland were given hypodermically. This gave regular strong contractions. The patient became noisy and excitable and was given ½ gr. morphine.

Dilatation was complete by 6:30 P.M. She was taken to the delivery room and under gas anesthesia it was decided to deliver the head with low forceps. Four minutes after beginning gas anesthesia the patient gagged and vomited. Respiration ceased and she became very cyanotic. Artificial respiration was resorted to and she soon resumed breathing. Her color returned and remained good and there was no coughing. The baby was delivered in good condition. The mother was returned to bed with pulse rate of 84 and respiration of 26.

By 9:3 P.M. the patient was cyanotic and gasping for air. Examination of the chest showed coarse bubbling rales throughout. Atropine 5 gr was given and inhalations of oxygen and carbon dioxide were started. Four hundred c.c.m. of 5 per cent

sucrose were given intravenously and the atropine dosage was repeated. The patient was placed in an oxygen tent and 1 ampoule of metrazol was ordered every four hours.

An x-ray study of the chest made the following day revealed very extensive coarse mottling extending throughout the right lung, most pronounced adjacent to the hilus, and gradually diminishing to the periphery of the chest. Large soft indistinct densities appeared as shadowing more evident in the middle lobe of the lung. In the left lung there appeared a similar but not quite so extensive mottling involving chiefly the lower portion of the lower lobe. Leucocyte counts varied from 17,200 to 7,000. In the oxygen tent the respiration rate remained high between 40 and 50 per minute with a pulse rate varying from 10 to 140. The temperature averaged only about 99 F. The patient coughed rarely and then raised small amounts of thick rusty sputum. Stained sputum revealed a streptococcus to be present.

There was but little change in the clinical condition during the time the patient lived. Repeated x-ray examinations of the chest made on four occasions showed progressive increase in the areas of density. The patient received two blood transfusions of 500 c.c.m. each. Death occurred on the thirteenth day after delivery and autopsy revealed both lungs to be the site of diffuse moist consolidation, with air present only in the extreme apices of the lungs.

The writer was able to collect histories of 14 other similar cases occurring in the practice of colleagues in nearby cities. Apparently aspiration pneumonitis is not a rare condition as 2 instances occurred within the last 10 years. It is most serious complication of labor. Among the 5 cases there were 3 deaths and the remaining cases required prolonged hospitalization.

Aspiration pneumonitis may be divided into two distinct types that in which the aspirated material is of a solid nature and that in which it is fluid. In the first, death may occur rapidly from the mechanical obstruction of the air passage. When the aspirated material is fluid in nature there results, apparently, chemical pneumonitis. The x-ray picture may resemble that of bronchopneumonia but there are clinical differences. The author believes that the reaction in the lung tissue results from certain fractions of the gastric juice itself.

The question arises as to whether the type and amount of premedication and the gas anesthesia used during labor have any effect on this condition. The author does not believe that the blame for aspiration pneumonitis can be placed on the anesthetic. A valuable suggestion as regards prevention of this complication may be that the patient abstain from all solid food during labor. Every delivery room should be equipped with an efficient suction apparatus. Possibly the anesthetist should not be permitted to fasten the gas mask on the patient's head.

JOHN W. NIXON, M.D.

Zucchi, C. A. Clinical Considerations on the Cases of Pulmonary Embolism Observed in the Rizzoli Institute during the Decade 1929 to 1938 (Considerazioni cliniche sui casi di embolia polmonare osservati all' Istituto Rizzoli nel decennio 1929-1938) *Chir d organi di movimento*, 1939, 25 153

Zucchi found that death due to embolism of the pulmonary artery occurred in 14 cases at the Rizzoli Institute during the past ten years this represented 9.08 per cent of all the deaths. Eleven of the patients were admitted with a traumatism of the lower extremities, and 1 each with deforming arthritis, rhizomelic spondylosis, and congenital dislocation of the patella.

Embolism may occur at any age, but is observed especially after the age of fifty years, in the present cases, the ages ranged from seventeen to seventy-two years, with the highest frequency between fifty-six and sixty-five. There were 12 men and 2 women, this proportion is the inverse of that generally reported and is probably due to the fact that the cases were mostly traumatic. Opinions on the influence of the seasons differ. November and December showed the greatest frequency of occurrence in the present series. The clinical histories revealed that the embolism occurred from four to twenty days after the traumatism or the intervention, and with major frequency about the fifteenth day, this corresponded to the number of days needed for the return of the cardiac activity, which is the principal cause of the mobilization of the thrombus, while the reduced cardiac activity of the first days favors the formation of the thrombus. The symptoms of embolism appeared suddenly in most cases and developed in from five minutes to eight hours, they were preceded by clinically demonstrable thrombosis in 2 cases and by pulmonary infarct in another 2 cases.

The diagnosis was made from the sudden appearance of marked dyspnea, a feeling of precordial anxiety, pallor with cyanosis of the mucosa, marked variations in the frequency, strength, and rhythm of the pulse, associated with nausea, vomiting, urgency of defecation and urination, and marked perspiration. In addition, the absence of heart disease and the execution of an effort or a movement shortly before the occurrence of the embolism were taken into consideration. An effort, however slight, is sufficient to dislodge a thrombus.

In death from embolism the sudden suspension of the circulation to the lungs is not the only factor to be considered. Necropsy showed in 1 case a small embolism in one of the branches of the pulmonary artery of the left lobe, and, undoubtedly, death was due to a reflex spasm of the entire pulmonary system caused by the presence of this small embolism. In case of preceding pulmonary infarct, death may be caused by the mobilization of new thrombi. In 1 of the patients who did not show cyanosis, an electrocardiogram was taken to clear up the diagnosis, it presented a lowering of the Q wave in the third lead, combined with a heightening of the ST wave in the

same lead, and a nodule in the descending R line in the second and third leads.

The treatment consisted of cardiokinetic drugs, oxygen, and venesection. Surgical intervention has been performed successfully by some authors. Various prophylactic measures have been recommended, but few have been of any use. The most reasonable ones seem to be abstention from surgical intervention in the old and the obese, pre-operative and post-operative treatment of slight cardiac decompensation, pre-operative removal of varicose veins, early reduction and immobilization of fractures, the administration of sympathol (vasoconstrictor), ligation of thrombosed veins, and removal of a thrombus. At the first signs of embolism 0.06 gm of eupaverin should be given intravenously and the dose repeated soon if the first injection remains without effect. Morphine, immobilization, and, if possible, embolectomy are indicated. RICHARD KEMEL, M.D.

Bergquist, G. Postoperative Thromboses Preliminary Report (Ueber postoperative Thrombosen Vorläufige Mitteilung) *Acta chir Scand*, 1940, 83 415

Bergquist's preliminary communication reviews the literature on postoperative thromboses. The present concept is that thromboses and embolism after operations are due probably to changes in the blood flow of the legs, to biochemical changes of the blood, and perhaps to damage of the endothelium. The author agrees with these views, but stresses postoperative changes in the blood flow ("whirlpool formation") causing a prethrombotic condition, which when persisting for some time leads to thrombosis because of changes in the composition of the blood and an increased tendency to coagulate.

The anticoagulant heparin has been used for a number of years by many authors in attempts to prevent postoperative thromboses. In order to find definite indications for the use of such an anticoagulant as a preventative, Bergquist studied the course of the coagulation time and the number of thrombocytes after operation. While the number of thrombocytes showed no important changes after operation, the coagulation time had a tendency to fall regularly after operation from the fifth to the eighth day, occasionally also to the tenth day.

Bergquist used Petré's method for determination of the coagulation time. A survey of all postoperative thromboses which occurred from 1929 to 1938 in his hospital showed that most of them happened around the same time postoperatively, or possibly somewhat later, i.e., from the sixth to the tenth day after operation.

Assuming that shortened coagulation time together with other factors (whirlpool formation) is a prerequisite for thrombus formation, Bergquist instituted heparin prophylaxis in cases in which the coagulation tests showed less than three minutes. Out of a test group of 4 such patients, 2 received heparin and remained thrombosis-free, and 2 received only the customary postoperative care. These

developed thrombosis and of them died from pulmonary embolism.

Bergquist gives heparin according to the following schedule:

As soon as the coagulation time falls below three minutes (according to more recent experience—as soon as the coagulation time diminution is more than one minute from the pre-operative value) 0.6 c.c.m. of 3 per cent solution of heparin are given intravenously. If the coagulation time after four hours still is subnormal, 1 c.c.m. is given, and followed by another check up after 3 hours. If the result still is unsatisfactory 0.6 c.c.m. are given, and test is made seven or eight hours later. No further administration has been found necessary.

Of the 5 patients studied for determination of the coagulation time, 8 showed values low enough to warrant the institution of heparin prophylaxis. They were given heparin, and no thrombosis occurred in any of them nor in any of the 4 other patients.

Bergquist has found that estimation of the coagulation time according to Petréu can be done advantageously from finger blood. If heparin cannot be given intravenously it should be injected intramuscularly but larger doses are required if this route is chosen.

HENRICH LARSEN, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Bordonaro, F. Clinical Contribution to Conservative War Surgery (*Contributo clinico alla chirurgia conservativa di guerra*). *Chir. e Organi di Medicina* 930 5 89

Bordonaro states that great advances have been made in conservative surgery of the most varied and grave lesions caused by firearms, because of the use of Loehr's method of treatment, which limits surgical intervention to a minimum and thereby facilitates the surgical service of the combat line. Loehr first employed his treatment in cases of acute osteomyelitis in which he made simple incision of the soft tissues and of the periosteum and applied cod-liver oil and plaster cast. The good results which he reported led to the use of the method in chronic osteomyelitis and in cases of other septic processes and of recent wounds with marked loss of tissue. The great rapidity and intensity of the processes of epithelization and granulation are attributed to the presence of vitamins A and D in the cod liver oil.

During the last Spanish War the method was used extensively and showed that it was possible to save extremities with enormous lesions which previously imposed immediate amputation. It allowed rapid automatization of the most serious wounds and limitation of gauze and rubber drainage in most cases as it necessitated only windows in the plaster cast to ensure the outflow of exudates. It could be applied during the first hours after the injury, as received and constituted the best expectant biological medication for the conservative surgical treat-

ment of the extremities. The biological and biochemical phenomena produced in the tissues by cod-liver oil create the possibility of reducing to a minimum the traumatism of initial surgical intervention on the foci of fracture and on the tissues. There is no necessity for inflicting long and careful preparation of the wound on patient not already in a state of shock. The early appearance of the repair processes provides efficient protection against secondary infection of the wound and helps in overcoming primary infection.

In the secondary treatment of open fractures of war the method has an undeniable effect on septical complications and especially on acute and chronic osteomyelitis of the fragments. It has been proved that the combination of the treatment with cod liver oil, immobilization in the plaster cast, and continuous skeletal traction by means of a metallic wire provides ideal results. In spite of the complication the course of the infection does not necessitate any surgical intervention, except for some incision of the soft tissues to give outlet to the pus formed in the osteomyelitic foci. In addition, it is possible to obtain delimitation and complete spontaneous elimination of sequestra, before cicatrization of the lesions and consolidation of the fractures, in spite of the marked loss of bony substance and the long period of suppuration. A whole series of factors which could derive from the systematic use of the method make it of immediate interest to the military sanitary service during war: these factors are the ideal immobilization of fractured extremities for the transportation of the wounded, the easiness of the treatment of open fractures passing through the collecting stations, and the simplification of the sanitary service of evacuation. In addition, the method saves the wounded from serious and prolonged sufferings due to the usual methods of early surgical treatment beginning at the front line.

RICHARD KRAUS, M.D.

Hewes, E. L. The Immediate Strength of the Sutured Wound. *Surgery* 930, 7 34

Wetting of catgut or silk sutures causes them to lose about 3 per cent of their dry thread strength. Knotting causes loss of from 4 to 50 per cent. Bulk wetting and knotting together cause loss of from 50 to 60 per cent of the dry thread strength. Thus functioning strength is not, however, always proportional to the dry-thread strength. Number 6 catgut does not have greater bursting strength than that of No. 4 and the corresponding functioning strength of different sizes of silk have much smaller range than their dry-thread strengths.

The holding powers of various soft tissues were tested in tensile strength machine. The catgut, which had holding power greater than that of the functioning strength of No. 6 catgut or silk as tested, and that only if the pull was directed perpendicularly to its true fibers. That case it took No. 6 catgut be stronger than the fascia.

The increase in wound strength resulting from the use of multiple sutures was studied by means of a sutured abdominal wall of a rabbit, in which the stitches were placed 1 cm deep. The holding power of the tissue increased, although not proportionally, up to the maximum when the sutures were 0.5 cm apart. The functioning strength of the suture material increased, however, in direct proportion to the number of stitches placed. The ratio, then, of functioning strength to holding power increases so that the greater the number of stitches the smaller the size of the suture material needed.

Experiments on suturing the skin of the dog showed that a continuous suture was no stronger than an interrupted suture line with the same number of bites. The former is obviously more risky, because if one strand breaks all is gone. Larger bites of fascia give slightly more strength than small bites, but this advantage is probably offset by more necrosis of tissue and more suture material in the wound.

The author concludes that there is no need of suture of any other tissue but fascia except to eliminate dead space or, in the case of the peritoneum, to prevent herniation, when multiple sutures are used there is no need of using a suture stronger than No. 0 catgut, increasing the number of sutures increases the holding power and provides a better ratio of functioning strength to holding power, better healing is usually obtained when deep bites are not used, placing sutures in fascia so that they will pull parallel to the fibers should be avoided by special construction of the wound, or else mattress sutures should be used, and interrupted sutures should be recommended as preferable to continuous sutures.

RICHARD WARREN, M D

Rocchi, F. Research on the Pathogenesis of Tetanus by Parabiosis (Ricerche sulla patogenesi del tetano mediante la parabiosi). *Polidini*, Rome, 1940, 47 sez med 33

In order to study the perfusion of tetanus toxin throughout the organism, the author injected it into several pairs of rats which had been previously united in parabiosis by the method of Morpugo. Four experiments were designed to differentiate the lymphatic, hematogenous, and neural routes through which the toxin might be conveyed.

In the first experiment, after 2 normal rats had been united in parabiosis for fifteen days, two lethal doses of toxin were injected into the right thigh of the right animal. In twenty-four hours the injected extremity became rigid in extension and after thirty-five hours the animal assumed a definite homolateral pleurothotonus. The other animal assumed an attitude of emprosthotonus. The animals were separated at this time and the one injected in the thigh soon died with local tetanus and pleurothotonus. The other animal slowly recovered, losing the tetanic attitude.

In the second experiment, the sciatic nerve in a parabiotic animal was isolated and injected with one lethal dose of toxin. After two hours the adjacent

15 mm of the nerve were excised and the wound was closed. In eighteen hours the animal developed tetanus of some of the thigh muscles and some homolateral pleurothotonus. The other animal later developed emprosthotonus.

The third experiment was conducted upon 2 parabiotic rats in which the distal end of the left rat's sciatic nerve had been anastomosed to the proximal end of the nerve of the other animal. Twenty days after the anastomosis, all cutaneous and muscular connections were severed and the left rat was given 50 lethal doses of toxin in the leg. The only bridge between them was the nerve, which was kept moist with saline. In eight hours, the right rat died with a syndrome of general intoxication. The nerve was immediately severed and a 1 cm segment of it was macerated and injected into a third rat which died in from thirty-six to forty-eight hours with tetanus on the side injected. The left rat died in thirty-six hours with tetanus in pleurothotonus.

The fourth experiment was concerned with chronaximetric determinations before and after the injection of tetanus toxin.

The following conclusions are formulated:

- 1 Tetanus effected by a route rigorously hematogenous is characterized by sustained contractions with the flexors predominating over the extensors, namely, emprosthotonus. However, subcutaneous or intramuscular injection of toxin is followed by classical local tetanus with multiple contractions. It is demonstrated that the same toxin can be made to yield the predicted types of tetanus as an exclusive function of the diverse routes of absorption.

- 2 In 2 parabiotic animals, the local tetanic attitude assumed in the 1 injected with the toxin is dependent upon the greater amount of tetanogenesis prevalent in the inoculated side.

- 3 The absorption of toxin through a nerve trunk occurs along the axis cylinders with localization in the corresponding nerve centers and also through the endoneural lymphatics with secondary hematogenous diffusion throughout the organism.

- 4 The so-called local tetanus is the result of accumulations in the corresponding nerve centers of two charges of toxin, one arriving via the axis cylinders and the other arriving via the lymphohematogenous route. Animals that apparently have tetanus of small muscle groups really have hyper-tonic tetanus which is clinically not apparent but which is demonstrable by chronaximetric studies in remote muscle groups.

FRANK McDOWELL, M D

Whittingham, H E. Anaphylaxis Following the Administration of Tetanus Toxoid. *Brit M J*, 1940, 1 292

The prophylactic inoculation of man against tetanus was until recent years performed by giving a subcutaneous or intramuscular injection of tetanus antitoxin soon after the receipt of an injury or during the incubation period of the disease. The main drawbacks to this type of prophylaxis are that the immunity given is only passive, partial, and temporary,

lasting merely a few weeks, and that serum sickness is a common occurrence.

To overcome these defects tetanus toxoid was developed, and it was used on a large scale from 1936 to 1938 by the British Army. This material apparently has the power to produce an active and relatively permanent type of immunity to tetanus, and it can be accepted as proved that for 10 years (some investigators say five years) after immunization with tetanus toxoid the antitoxin content of the blood can be relied upon either to prevent the occurrence of tetanus or so to modify the infection as to guarantee cure with modern anti-tetanus therapy. Two doses of 1 cm. are given subcutaneously at an interval of not less than six weeks.

The author describes 2 cases of anaphylactic shock following the administration of a second dose of tetanus toxoid, and reviews the incidence of general and local reactions following the subcutaneous inoculation of 67,041 healthy individuals. Acute reactions occurred in 11 cases (0.003 per cent) less severe constitutional symptoms in 12 cases (0.017 per cent) and local reactions in 65 cases (0.096 per cent). Although the incidence of general reaction is rare it is advisable to be prepared to treat it expeditiously with adrenaline when it does occur. *JACOB M. MONA, M.D.*

Flora W. M. Lamont, A., and Sh. Mackay H. B.
Studies on the Cause of Death in Tetanus.
Ann. Surg. 1940, 546.

In an exhaustive series of animal experiments, the authors found that the injection of as little as 1/400 of a lethal dose of tetanus antitoxin placed in a non-vital area of the central nervous system (the lumbar cord of a dog) caused death. The injection of less than a lethal dose of toxin into organs other than the central nervous system is never fatal.

Studies of the metabolic changes consequent to the constant muscular spasms revealed no changes which would account for death. In the absence of muscular spasms life is prolonged to some extent. However, those animals receiving relatively small doses of toxin have a far longer period of violent convulsions and survive longer than those animals receiving relatively large doses.

All of these facts led to the conclusion that the lethal agent must be carried from the point of injection of the toxin in the lumbar cord to some vital center. The lethal agent does not travel up the cord, because by transecting and by ligating the injected cord it was shown that the lethal agent did not pass up the spinal canal in the cerebrospinal fluid or within the substance of the cord itself.

Death cannot be attributed to multiplication of the tetanus antitoxin molecule. This possibility was thoroughly explored and no experiments showed such an occurrence. General signs of tetanus, such as trismus, opisthotonos, and muscular rigidity never appear in animals dying from an injection of toxin into the cord. Finally death occurs even though the blood and lymph contain large amounts of anti-tetanic serum throughout the entire course of

the experiment. Obviously if the toxin were multiplied and absorbed into the blood stream, it would be neutralized by the antitoxin.

These five essential facts led the authors to suggest that tetanus toxin in the spinal cord is altered into or liberates a different lethal agent, which is absorbed by the blood stream and is carried to some vital center where it produces its lethal effect.

Further experimental evidence is presented supporting this suggestion, which has been made by previous workers, viz., Courmont and Doyen, Feld, Zepalk, and Zager, and Friedmann. Alteration of the toxin such as described would explain the experimental results of Abel and Chalmers, who showed that after the intravenous injection of one or more lethal doses of tetanus toxin, the administration of even large amounts of anti-tetanic serum failed to save life if before the serum was given the animal had clearly evident symptoms of descending tetanus and had fixed in his thighs one or more lethal doses of the toxin. They showed further that even though the animal thus had fixed many lethal doses of toxin, the anti-tetanic serum could save life if given not later than at a certain stage of the incubation period, before the appearance of symptoms of general tetanus. This would also explain the puzzling clinical finding that the use of tetanus antitoxin has not appreciably lowered the mortality rate of those patients who did not receive antitoxin until after the appearance of the central-nervous-system symptoms of tetanus.

It then appears likely from animal cross-circulation experiments and others that the lethal agent is not neutralized by tetanus antitoxin, and that the lethal agent may act chiefly on the respiratory center. For this reason the lethal action of this new substance may be enhanced by respiratory depressants. It appears that the use of respiratory-depressant drugs in cases of human tetanus should be undertaken with extreme caution. Probably respiratory stimulants and artificial respiration will prove of value.

It is emphasized that this experimental work so far reported should by no means be interpreted as making unnecessary the use of tetanus antitoxin as a therapeutic agent in clinical tetanus. Since in human beings there is no way of telling whether a lethal dose has been fixed, the clinician should continue to use antitoxin in local or central tetanus in the hope that a lethal dose has not yet been fixed by the body tissues. *JOHN E. KIRKPATRICK, M.D.*

Blitman, P. A Report on Serum Therapy of the Malignant Pustule of Anthrax (*Contributo alla sieroterapia del carbonchio*). *Satimene med.* 1939, 27, 327.

The author reviews the history of a thrax and its treatment, and presents a series of cases seen in the Clinic of Infectious Diseases of the University of Rome. This series represents a period beginning with March, 1936 and concluding with September, 1939. All cases are treated exclusively with serum.

and are offered for this reason, as being helpful in the evaluation of the ultimate place of serum in the management of anthrax. The highest incidence of infection was found to exist in rural communities, among male adults, facts easily explained by the occupational character of the disease. For the most part, the mode of transmission was by direct contact with infected animals, either as herder or butcher, although isolated cases seemed to be traceable to fly-bites, penetrating wounds from infected instruments, or the domestic handling of infected meat. It follows that all cases presented the primary cutaneous form, either pustule or malignant edema, and no case of pulmonary or intestinal anthrax came under observation, although in a small number of cases the infection spread and septicemia resulted, as proved by positive blood cultures. In all but 6 cases the lesion occurred singly, most frequently on the head, neck, and upper extremities. All cases were proved, not only by the clinical characteristics but by the bacteriology.

Treatment was begun in 2 cases on the first day, in 12 cases on the second day, in 32 cases on the third day, in 12 cases on the fourth day, in 12 on the fifth day, and in the remaining cases at a later time. For the most part the serum was given by intramuscular injection, the intravenous route being reserved for those cases in which septicemia was present or for those which appeared to be in serious condition. The amount of serum varied from 100 to 200 c cm daily, according to the gravity of the case. Duration of the treatment generally varied also from three to six days, the average total dose being from 500 to 800 c cm.

No disturbances were noted other than serum sickness, which occurred in 32 of the 90 cases constituting the series and was manifested chiefly by urticarial or morbilliform eruptions, without elevation of temperature. The beneficial results of the serum therapy were observed from the second day on, and the local lesion was seen to diminish rapidly along with the constitutional signs and symptoms, the temperature returning to normal from the second to the sixth day. The mortality for this series was 7.7 per cent. One of the 7 patients died several hours after admission, 3 others entered with positive blood cultures from the fourth to the sixth day, while the remainder showed concomitant pre-existing disease of a serious nature.

The results of serum therapy were therefore summarized as follows: in 1 case, adequate amounts of serum were not able to prevent the development of septicemia, in 3 other cases in which septicemia was already present, generous amounts of serum administered intravenously were not sufficient to prevent a fatality. It was therefore concluded that the local lesion should be treated only by warm moist sterile dressings and by the liberal administration of serum, and that septicemia, once it has set in, is difficult to cure, even with large amounts of serum administered intravenously.

EDITH FARNSWORTH, M D

Stephenson, D., and Ross, H. E. Chemotherapy of Clostridium-Welchii-Type-A and Clostridium-Septique Infections in Mice. *Brit M J*, 1940, 1, 471.

Sulfanilamide and sulfapyridine were found to protect mice against a small number of lethal doses of clostridium welchii Type A injected intraperitoneally as suspensions of vegetative organisms in sterile soil suspension. Treatment with anti-toxic serum was effective in the case of a strain of high toxigenicity, but was ineffective against a strain of low toxigenicity but of probably higher invasiveness. When the infected soil suspensions were injected intramuscularly, considerably more organisms were necessary to produce a fatal result. The drugs were of value only against sublethal infections. Serum treatment was better, and saved mice even from lethal doses.

Clostridium septique. Sulfanilamide had little influence on infections of mice produced by the intraperitoneal or intramuscular injection of suspensions of sporing and non sporing organisms in calcium-chloride solution or sterile soil suspension. Sulfapyridine was found to be better. Given in large doses, it saved 50 per cent of the animals. Treatment with a single dose of anti-toxic serum was at least as effective as sulfapyridine, but the best results were obtained when sulfapyridine was combined with serum. Large doses of the drug were given immediately after infection, and serum was given up to twenty-four hours later.

By tests made with these two strains of clostridium oedematis, it has been shown that neither sulfanilamide nor sulfapyridine has any influence on the course of the infection. SAMUEL KAHN, M D

Leriche, R. The Treatment of Infections by the Intra-Arterial Route (A propos de la thérapeutique des infections par voie intra artérielle). *Mém Acad de chir*, Par, 1940, 66, 47.

Leriche has employed intra arterial injections since 1929 and has found this procedure one of the most effective methods of treating certain localized surgical infections. The intra-arterial injection of an antiseptic brings it most rapidly and most directly to the infected tissues, its effect may be enhanced by blocking the circulation temporarily below this point.

The author has employed various antiseptics for intra-arterial injection, but has found mercurochrome to be the most effective, when this drug is given intravenously it may have certain undesirable effects, but he has never seen the slightest ill effect when it is given intra arterially, even if injections are repeated daily for a week or two. Recently he has used soluseptazine (a sulfanilamide compound), in some cases with equally good, but not superior, results.

Intra arterial injections of mercurochrome have been employed in cases of suppurative arthritis, in complicated fractures, in diffuse phlegmon, in lymphangitis, and in infected gangrene. The injec-

tions have been combined with such surgical procedures as are indicated to establish drainage and remove diseased tissue. Intrarterial injections may also be used in cases of trauma, when there is infection or danger of infection of the wound. However this does not make it possible to dispense with proper surgical treatment of the wound—excision of injured tissue and drainage. The method might well be employed in war wounds.

Leriche has also employed scurocal by intra-arterial injection in the treatment of the pain of gangrene. Not only does scurocaline so administered have a anesthetic action, but it also has vasomotor action, producing dilatation of the smaller blood vessel and hyperemia of the tissues with resulting local leucocytosis and other changes that aid in combating infection. The author's observation of the effect of the therapeutic solution injected intra-arterially leads him to conclude that these drugs may have in addition to their direct anesthetic action, a vasomotor action which increases the resistance of the tissues to infection.

ALICE M. MEYER.

Flier, A. T. and James, G. V. Doseage of Sulfanilamide in the Prophylaxis of Wound Infections. *Lancet* 1940, 28 487.

The effect were compared in man, of plain sulfanilamide (bellac coated, collodion coated, and keratin-coated tablet and propeptasine) regards concentration of sulfanilamide in the blood after the administration of doses of 5 gm. in the different

types of tablets. Also compared were the percent excretion, and the rates of excretion of sulfanilamide after different tablets, and their efficiency was expressed by dividing the concentration of the sulfanilamide in the blood at any given time by the rate of excretion at that time. Other studies included comparison of the concentrations of sulfanilamide in the blood after single 5 gm. dose given in intact tablets and in solution. The blood concentration levels after 5 gm. of sulfanilamide every eight hours and after treatment with the recommended dosage were recorded.

The results obtained supported in the main recommendations made by the War Office for the prophylactic use of sulfanilamide in air casualties. A first dose of 5 gm. given in solution for rapid absorption as divided succeeding doses of 5 gm. starting 4 hours after the first dose, should be given every four hours in intact tablets to prolong their effect. Administration of the first dose as soon as possible after wounding is essential in order to combat the gas-gangrene organisms which are implanted at the time of injury and which develop rapidly. Prophylaxis must be continued for at least four days because many of the bacterial septico-coccal infections are caused later in the hospital. The danger of delay is stressed and it is pointed out that if several hours have lapsed before treatment begins the first few doses should be increased. The use of propeptasine or of coated tablets would require more prolonged retention of the drug did not seem to offer any advantages. WALTER H. NOLAN, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Miler, H. C. Roentgen Aspects of the Upper Retro-esophageal Pulmonary Borders. *Am J Roentgenol*, 1940, 43: 168

In the upper portion of the thorax, posterior to the esophagus, the right and left pleural spaces closely approach one another under normal conditions. An appreciation of this anatomical fact is of importance in the interpretation of roentgenograms because the pulmonary borders in this region are sometimes outlined roentgenographically. Various physiological and pathological conditions may displace the medial pleural margins and cause difficulty in the identification of the roentgen shadows. Anatomical studies on cadavers to show the limitations of the pleura in this region are discussed at some length and previous roentgenographic observations are also given consideration.

Although ordinary chest roentgenograms may not reveal the medial pulmonary borders in the upper posterior portion of the thorax, dense ones produced with the aid of the Potter-Bucky diaphragm sometimes show them. In such cases they present as curved margins of aerated lung close to the midline of the spine superimposed upon the air outlined tracheal shadow. In lateral projections pulmonary tissue in the retro-esophageal space is seen to best advantage. It is evident especially when kyphosis is present.

Pathological conditions may produce displacements of these medial borders. Scar tissue contraction may cause traction to either side which may be accompanied by a tracheal and esophageal shift. Inequalities in the intrapleural pressures of the opposing hemithoraces may also displace the structure and such herniation may be incorrectly interpreted as representing a pulmonary cavity or emphysematous bulla of the other lung. Sometimes posterior pulmonary borders are misinterpreted for medial margins of the lung anteriorly. Except under most unusual circumstances the pleural borders do not approach the midline anteriorly above the superior margin of the manubrium.

ABRAHAM HARTUNG, M.D.

Doubt, H. P. The Roentgenological Aspects of Bronchomycosis. *Radiology*, 1940, 34: 7

The roentgen manifestations of the bronchomycosis are so potent as to defy exact classification in most instances. The classification of the bronchomycosis given by Castellani is quoted.

The pulmonary lesions of histomycosis are less common than the lesion involving other viscera and the skin. The clinical picture often imitates that of tuberculous infection to make a positive diagnosis the problem of histomycosis must be demonstrated in the lesion itself. The pulmonary roentgeno-

gram may reveal considerable increase in the hilar areas and in the bronchovascular markings, with an unusual studding following these markings. The characteristic studding follows one or more of the main trunks, but does not quite reach the periphery. There is usually an area of lung density around the periphery. Some of the findings may suggest miliary tuberculosis, except that there is more fibrosis. One illustrative case is reported, in which there was extensive miliary parenchymal infiltration throughout both the lungs with areas of coalescence in the bases.

About 15 per cent of the cases of actinomycosis observed clinically involve the thorax. Pulmonary infection is often secondary to infection in other parts of the body. The roentgen findings are not characteristic, areas of consolidation are present, and in some instances there are localized nodules. If there is pleural involvement, fluid may be present in the pleural cavity. Abscess cavities may be found in the lung. The diagnosis is made by the finding of sulfur granules in the sputum. One case is reported as follows:

A boy of seventeen had abdominal actinomycosis, and there were several draining sinuses over the abdomen. Pulmonary roentgenograms revealed a large, smooth, rounded shadow of increased density in the base of the right lung just above the diaphragm, this mass diminished but did not entirely disappear after roentgen therapy.

Monilia may be the cause of primary bronchopulmonary disease, but it may also be present as a secondary invader in cases of primary bacterial infection. Variable changes are found in the lungs. The hilar areas are usually enlarged, and infiltration of a patchy type may extend from these areas throughout the lungs being usually less marked in the apices. An extensive network of fibrotic infiltration and studding along the bronchovascular markings often extend throughout the lungs. In the patient here reported, there was, in addition to the bilateral hilar enlargement and diffuse pulmonary fibrosis, pleural reaction along the walls.

Aspergillus is not common in this country as a cause of primary pulmonary disease, but it has occasionally been noted as a secondary invader.

Penicillium and mucor are other filamentous fungi which are of clinical importance, but they are usually secondary invaders. One case in which penicillium infection was probably not the primary cause of death is reported.

Some of the literature on coccidioid granuloma and streptothricosis is reviewed. It is important when a patient is encountered who has symptoms suggestive of but without atypical for tuberculosis and who presents a typical roentgen picture to make repeated microscopic examination and to culture the sputum. HARTUNG, A. M.D.

Hartung, A. Pulmonary involvement in the Lymphoblastomas, With Special Reference to Roentgen Aspects. *Radiol* 25 910, 34 3

Although some writers have included more separate entities under the term lymphoblastoma, the author has included for the purposes of this paper only Hodgkin disease lymphosarcoma and chronic lymphatic leukemia. Thirty five cases are reviewed, including 24 of Hodgkin disease, 6 of lymphosarcoma and 5 of chronic lymphatic leukemia.

On the basis of this study it is concluded that pulmonary involvement is so common and the roentgen findings are so characteristic, that routine chest examination is indicated in patients who have lesions apparently limited to the superficial nodes. Tumorous masses in the mediastinum, with or without enlarged hilar nodes, and pulmonary infiltrations usually in close proximity to them are strong probable evidence that the condition is of this nature, especially if the changes are bilateral.

HAROLD C. OCKENFELS, M D

Levene, G., Lowman, R. M., and Wisting, E. G. Roentgen Diagnosis of the Strawberry Gall Bladder. *Radiology* 940, 34 30

The strawberry gall bladder (cholesterols or lipofuscs of the gall bladder) is one of the earliest forms of gall-bladder disease. On roentgenographic examination, these gall bladders show good visibility and complete emptying of the dye as do normal gall bladders. As a consequence, many strawberry gall bladders are diagnosed "normal" or "negative." The authors analyzed a series of 3 proved cases of strawberry gall bladder and determined in what way they differed on roentgenological examination from normal gall bladders.

The diagnosis of strawberry gall bladder depends on the following criteria: good visibility; active contraction; good compressibility; local and reflex tenderness; and rapid emptying. In discussing these criteria, it is pointed out that good concentration of dye was invariably present. If poor concentration was present the cases were classified as chronic cholecystitis. Likewise all gall bladders in this proved series exhibited active contractions, as contrasted with the poor or absent contractions seen in chronic cholecystitis. These contractions were best seen after the administration of motor meal consisting of 4 egg yolks, and 8 oz. of 4 per cent cream flavored with ginger ale. Roentgenoscopic observations were made routinely. This proved in enabling the observer to determine the elasticity and compressibility of the gall bladder by stripping it between the two index fingers. Motility after motor meal as well as local tenderness was noted on roentgenoscopic examination also. Local tenderness detected in 90 per cent of the cases in this series. Reflex tenderness in the right costomuscular angle was found in 9 per cent of cases. This local and reflex tenderness is of considerable diagnostic importance.

The strawberry gall bladder empties much more rapidly after motor meal than normal or chron-

ically diseased gall bladder. It was found that on the average the normal gall bladder empties in four hours, the strawberry gall bladder empties in one hour and fifteen minutes and chronically diseased gall bladder requires five or more hours to empty. This rapid emptying of the strawberry gall bladder is of great diagnostic significance.

The authors believe that many cases of early gall bladder disease are erroneously diagnosed as "very active" and urge that close attention be focused upon this problem.

LUTHER H. WOLFE, M D

Heavitz, T., and Smith, R. M. An Anatomical, Pathological, and Roentgenological Study of the Intervertebral Joints of the Lumbar Spine and of the Sacro-Iliac Joints. *Am J Roentgenol* 940, 43 73.

The value of the oblique projection of the lumbar spine as indicated by studies of various authors given consideration at some length. The authors made studies of specially prepared specimens of 25 human adult male lumbar spines and pelvis and arrived at the following conclusions:

1. Facets and pophysal (intervertebral) joints of the lumbar spine the axes of which are other than 45 degrees from the sagittal plane may falsely appear to be the site of pathological processes in the routine 45 degree oblique views. 13 of the 25 specimens although the pophysal joints were grossly involved, the 45 degree oblique roentgenogram strongly suggested pathological changes, in all of these specimens the angle of the joint line, measured from the sagittal plane, exceeded or was less than 45 degrees.

2. Accessory ossicles (epiphyses) at the tips of the articular facets are frequently not visualized on the roentgenogram, and one may infer that fractures in this region might also remain undiagnosed.

3. Degenerative changes in the intervertebral discs are noted on the roentgenogram only after they are advanced and associated with narrowing of the intervertebral space and marginal bony proliferation.

4. Nuclear herniations in the vertebral body are visualized only when they are surrounded by some of osseous sclerosis. Herniations of the intervertebral disc in the vertebral body (Schmorl's cartilage nodes) measuring from 4 to 8 mm. in diameter are present grossly and evident roentgenographically in 3 instances; they are not visualized on the roentgenogram, although present in the gross specimen in 3 other instances.

5. Subluxation of the articular facets, as described by Hadley occur most frequently in the anterior part of the posterior part of the intervertebral disc. Apparent subluxations in the presence of intervertebral discs of normal height are due to bony proliferation of the articular margins of the facets.

6. The diagnosis of degenerative changes, especially of ankylosis of the sacro-iliac joint, by means of the roentgenogram is frequently not corroborated by actual dissection. The 45 degree oblique projection

penetrated directly through the upper part of the joint space in only 6 of 28 normal sacro iliac joints

6 The oblique view of the lumbar spine is valuable in visualizing marginal proliferation of the vertebral bodies, which is usually most advanced antero-laterally, and it is an additional method in diagnosing impingement of the fifth lumbar transverse process against the sacrum or ilium

Studies of the articular facets and apophyseal joint spaces in other projections were also made and findings which indicate the most favorable conditions for obtaining the desired information are presented Detailed data of 80 lumbar spines and pelvis examined are tabulated and numerous illustrations of dry specimens are included to demonstrate anatomical variations Anomalous and pathological changes found are also described Investigation of 100 adult lumbar spines in relation to accessory articular processes revealed accessory facets, uni-lateral or bilateral, single or multiple, in 14

Experimental studies of vertebral bodies were also made and are described with a view toward obtaining information which might be of value in the roentgen diagnosis of intervertebral-disc herniations into the vertebral bodies The following factors were found to determine the visibility of a bony defect in the roentgenogram

- 1 State of calcification or trabecular condensation of the surrounding bone
- 2 Content of the defect
- 3 Relative amounts of cortical and spongy bone overlying the defect
- 4 Diameter of the transradiated bone which is superimposed over the defect
- 5 Distance of the defect from the tube and from the film
- 6 Direction of the longest axis of the defect in relation to the central roentgen ray beam

Anatomical, pathological, and roentgenological observations on the sacro iliac joint were also made and are described in detail In 100 pelvis studied, degenerative changes, consisting of articular cartilage and marginal bony proliferation, were seen in 37 specimens, and ankylosis of the sacro iliac joint was present in 21 specimens The variations and irregularities in the contour of the articular surface of the sacro-iliac joint, and the deviations in the plane of the joint surface at various levels of the joint in the same specimen and in different specimens, indicate that no one roentgenographic projection may be depended upon for its accurate visualization

ADOLPH HARTUNG, M D

Maxfield, J R, Jr, and Martin, C L The Evaluation of Roentgen Therapy in Sinus Disease *Radiology*, 1940, 34 300

No method of treatment of diseases of the accessory nasal sinuses has been entirely satisfactory, but conservative treatment should be tried first, inasmuch as poor medical results can be supplemented by surgical procedures, but poor surgical results cannot easily be corrected by medical treatment

The greatest benefit to be obtained from roentgen irradiation of the sinuses is in the hyperplastic type of sinusitis in which roentgenographs show thickened membranes and the patients have a thin watery discharge from the sinuses, frequent colds, or chronic cough The shorter the duration of symptoms, the greater the chance of good results, and the greater the possibility of permanent cure

The authors liken the response of the thickened hyperplastic sinus membranes to the response of keloids to roentgen therapy The longer the duration of either, the less the likelihood of relief They advise the use of roentgen therapy following radical operations on the antra, for they believe that this will prevent the return of the hyperplastic tissue, just as it does after the removal of keloids Roentgen therapy should be used only after the use of conservative measures by a competent otolaryngologist, and should be used in co operation with, rather than in competition with, the work of this specialist The patient should be informed of the uncertainty of good results Irradiation therapy is definitely contraindicated when there is not good drainage through the natural ostium or through "windows" in the sinuses, or in patients who have a tumor mass in the sinuses, inasmuch as the latter might be malignant

After treatment the patient usually experiences a feeling of fullness in the face, and an increased discharge for from twenty-four to seventy-two hours After this period, the discharge is diminished in amount, and thicker If pain is present, it is usually relieved in seventy-two hours Those patients who experience relief in from twenty-four to forty-eight hours after treatment usually get the best results The maximum response is usually reached in from three to four weeks following therapy Of 16 acute, uncomplicated cases, 7 were cured and 8 were improved Of 9 acute, complicated cases, 5 were unchanged and only 1 was cured Of 18 chronic uncomplicated cases, 9 were unchanged, 6 were improved, and only 2 were cured Of 14 chronic complicated cases, 12 were unchanged after irradiation The authors conclude that although roentgen therapy does give relief in a certain percentage of cases, it is not a panacea for all sinus diseases

HAROLD C OCHSNER, M D

Peck, W S, and McGreer, J T, with Kretzschmar, N R, and Brown, W E Castration of the Female by Irradiation The Results in 334 Patients *Radiology*, 1940, 34 176

The authors have made studies of the records of 334 patients who were treated for benign lesions with roentgen rays or radium, with the following objectives

- 1 Determination of the efficiency of castration by radiation methods
- 2 Establishment of the required ovarian dose for permanent castration
- 3 Development of a treatment technique to deliver a known and constant dose of radiation to the ovaries of any patient

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HAROLD C. OCHSNER, M.D.

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LEWIS H. WOURM, M.D.

Horwitz, T. and Smith, R. M.: An Anatomical, Pathological, and Roentgenological Study of the Intervertebral Joints of the Lumbar Spine and of the Sacro-Iliac Joints. *Am. J. Roentgenol.* 940, 43 73

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Facets and apophyseal (intervertebral) joints of the lumbar spine the axes of which are other than 45 degrees from the sagittal plane may falsely appear to be the site of pathological processes in the roentgen 45 degree oblique views. In 3 of the 37 specimens, although the apophyseal joint was grossly involved, the 45 degree oblique roentgenogram strongly suggested pathological changes. In all of these specimens the angle of the joint line, measured from the sagittal plane, exceeded or was less than 45 degrees.

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After treatment the patient usually experiences a feeling of fullness in the face, and an increased discharge for from twenty four to seventy two hours. After this period the discharge is diminished in amount and thicker. If pain is present, it is usually relieved in seventy two hours. Those patients who experience relief in from twenty four to forty eight hours after treatment usually get the best results. The maximum response is usually reached in from three to four weeks following therapy. Of 16 acute, uncomplicated cases, 7 were cured and 8 were improved. Of 9 acute, complicated cases, 5 were unchanged and only 1 was cured. Of 18 chronic uncomplicated cases, 9 were unchanged, 6 were improved, and only 2 were cured. Of 14 chronic complicated cases, 12 were unchanged after irradiation. The authors conclude that although roentgen therapy does give relief in a certain percentage of cases, it is not a panacea for all sinus diseases.

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- 1 Determination of the efficiency of castration by radiation methods
- 2 Establishment of the required ovarian dose for permanent castration
- 3 Development of a treatment technique to deliver a known and constant dose of radiation to the ovaries of any patient

4. Determination, if possible of the ovarian dose for temporary castration.

Details of the different techniques of irradiation used, methods on which calculations of dosages were based, and findings which served to assess the objectives sought are discussed at considerable length.

The following conclusions were drawn:

1. A dose of about 6-5 roentgens delivered to the ovaries produced permanent castration in the whole group of 73 patients.

2. In 34 (93 per cent) of 36 patients there was permanent castration with from 500 to 625 roentgens delivered to the ovaries.

3. In this series even comparatively small doses of radiation to the ovaries produced permanent castration in majority of cases. It appears that temporary castration cannot be produced with any degree of dependability.

4. A formula has been developed for calculating the surface dose to multiple ports necessary to produce a planned ovarian dose when ports of various sizes and different depth dose tables are used.

5. Techniques and dosage tables for patients with pelvises of different sizes have been developed to deliver a uniform ovarian dose.

6. Castration of benign (or in bleeding) better due to abnormal ovarian stimulation or normal menstruation, can be accomplished satisfactorily by irradiation of the ovaries.

7. There is no indication that irradiation castration results in serious impairment of health. The menopausal symptoms are no more severe or frequent than those which follow surgical castration.

ANDREW HARRIS, M.D.

Pohle E. A. The Treatment of Infected Hemangiomas. *Am. J. Roentgenol.* 1940, 43, 463.

Radiation therapy, especially with radium, constitutes the method of choice in the treatment of vascular nevi. Very satisfactory cosmetic results are obtained in approximately 75 per cent of the cases. Only the port-line nevus is unsuitable for irradiation.

In studying the results in a series of 5 patients with hemangioma observed during the last decade at the Wisconsin General Hospital, the author became interested in the problem of secondary infection of these lesions. In order to obtain further information on this subject he mailed questionnaires to 30 well known radiologists and dermatologists throughout the country along the following questions: (1) how many cases of infected vascular nevi have you seen? (2) what is the approximate percentage of incidence in your own cases? (3) do you recommend radium therapy of infected vascular nevi? and (4) if the answer to question No. 3 is in the affirmative, do you vary the dose as compared with noninfected vascular nevi? Replies were received from 4 sources, of which are used in this present survey. The respective answers are arranged in the form of table and in this table are added the brief case reports of his 4 cases, several photographs being used for illustration.

The conclusions are that the incidence of secondary infection in vascular nevi is low as it varies from 1 to 5 per cent in the four cases it was 6 per cent. Infection does not constitute contraindication to radium therapy and if radium is applied the doses must be smaller and given at greater intervals than is customary in the noninfected vascular nevi.

T. LUTCHER, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Young, F G The Pituitary Gland and Carbohydrate Metabolism *Endocrinology*, 1940, 26 345

While the relationship of the pituitary gland to carbohydrate metabolism remains obscure, certain observations of the action of extracts made from the anterior lobe of this gland are beginning to bring the subject into light

By treatment with anterior-lobe extracts an insensitivity to the action of insulin has been cultivated in normal and hypophysectomized animals This anti-insulin effect is attributed to a "glycotropic" substance which, since it is not also diabetogenic, cannot be identical with the diabetogenic principle of the anterior lobe of the pituitary gland However, it may be one part of a diabetogenic complex in which a number of active principles are concerned Although not yet isolated, this substance, on the basis of available evidence, differs from prolactin and from the thyrotropic, gonadotropic, ketogenic, and melanophore expanding substances of the gland

A second effect, ketogenesis, produced in animals treated with anterior lobe extracts, may be due to a specific ketogenic factor, although it must still be shown that the ketogenic factor and the growth and diabetogenic principles are not the same, or that the ketosis which occurs is not due to a diminution in carbohydrate and protein catabolism caused by the extracts

A diabetogenic action which has been demonstrated in anterior-lobe extracts by the establishment of a permanent diabetic condition in normal dogs is thought to be due to a principle which differs from prolactin and the thyrotropic, gonadotropic, "glycotropic" or melanophore expanding substances of the gland This diabetic condition does not undergo spontaneous remission Although the animals are able to survive for long periods without insulin therapy, some of them may require more insulin to control glycosuria than depancreatized dogs, and if the hormone is suddenly withdrawn after the animal has received insulin therapy for a period, the animal may die in a state which resembles diabetic coma

An increase in the size and number of the islets of Langerhans has been observed in the rat pancreas after injections of anterior lobe extracts Since this cannot be entirely explained as a compensatory reaction to the diabetogenic factor, the existence of a fourth, pancreotropic, action of the anterior lobe must be considered

The author suggests that since diabetogenic preparations from the anterior lobe have been observed to possess growth promoting activity, it is barely possible that the growth substance and the diabetogenic principle may be closely related if not

identical The diabetogenic action may become manifest in those cases in which the pancreas secretes insufficient insulin to induce nitrogen retention and promote carbohydrate oxidation, and the growth-promoting action may be exhibited in those animals that can elaborate an adequate amount of insulin

EDWARD W GIBBS, M D

Soskin, S The Liver and Carbohydrate Metabolism *Endocrinology*, 1940, 26 297

The origin of blood sugar from non-carbohydrate precursors in the fed or fasting animal is not clearly understood After careful analysis of the results obtained by studies of the D N ratios in experimental animals, the author concludes that sugar is derived partly from protein but that this is not the only source The dextrose component of the D N ratio represents the net remainder after the extrahepatic utilization of sugar is subtracted from the hepatic blood sugar formation Once this is granted, it may be concluded that the breakdown of protein cannot supply sufficient sugar for both excretion and utilization, and therefore the liver must form sugar from fatty acids as well as from protein

There is much evidence to indicate that carbohydrate utilization in the diabetic organism is not as markedly impaired as one might suppose If the utilization of carbohydrate was not a factor in the D N ratio of the whole diabetic animal, similar D N ratios should be obtained by experiments with isolated livers, but this is not the case

The respiratory quotient of the body as a whole, like the D N ratio, is also not the index of a single process The interpretation of the non protein R Q of 0.7, which is characteristic of the fasting and the diabetic states, involves the assumption that the only vital processes which consume oxygen and give rise to carbon dioxide, except protein catabolism, are those associated with the oxidation of fat However, there is adequate proof that other processes which require oxygen or yield carbon dioxide occur under these same conditions Since the R Q appears to be of a composite nature, it is difficult to justify the accepted interpretation of a 0.7 value in view of the evidence which indicates that carbohydrate utilization proceeds under a variety of conditions in which this R Q is obtained

The diabetic R Q can be interpreted best as a result of at least two factors a low component resulting from the new formation of sugar from fatty acid and protein, and a high component due to the oxidation of that carbohydrate Furthermore, since this gluconeogenesis occurs in the liver, the low R Q values obtained from determinations performed on isolated livers confirm this interpretation

Ketosis in diabetes and other conditions has been attributed to either (1) products of incomplete fat oxidation which accumulate because of a lack of

simultaneously utilizing carbohydrate, or () intermediate metabolites which appear during the conversion of fatty acid to sugar and accumulate in excess amounts whenever the rate of gluconeogenesis from fat becomes abnormal. On the basis of existing evidence the author believes the second concept to be correct.

The ability of the body to rapidly adjust the blood sugar level, which is represented by the normal curve of a dextrose tolerance test, has been explained in terms of increased sugar utilization and storage due to increased insulin secretion. The diabetic type of curve has been attributed to a lack of pancreatic response to the administered sugar and consequent deficiency in sugar utilization and storage. However from studies of depancreatized and hepatectomized dogs it appears that the liver and not the pancreas is the essential organ in the metabolic reactions which determine the normal dextrose tolerance curve. In the presence of adequate insulin the normal liver after the administration of dextrose decreases the output of blood sugar which it has been supplying from its own resources.

The coincident decrease in gluconeogenesis which compensates the diminished output of sugar by the liver removes a low component of the composite R.Q. and thus explains part of the rise in the R.Q. which follows sugar administration. The stimulus which elicits the hepatic inhibitory response is the blood sugar itself, and the threshold of stimulation of the hepatic mechanism in particular animal depends upon the endocrine balance of that animal and coincides with the level of blood sugar which it habitually maintains. EDWARD W. GIBBS, M.D.

CORRI, C. F. Glycogen Breakdown and Synthesis in Animal Tissues. *Endocrinology* 940, 20-235.

Until recently little was known regarding the enzymatic processes concerned with the breakdown and synthesis of glycogen in liver and muscle. The author presents a brief review of the recent advances which have been made in the study of this problem.

An enzyme phosphorylase, which initiates the breakdown of glycogen has been obtained from extracts of liver and other organs. This enzyme requires for its activity the presence of coenzyme, adenylic acid, and acts in an anaerobic environment. It is thought to be the catalytic agent for the reaction between glycogen and phosphoric acid which results in the formation of glucose-1-phosphate.

This hexose phosphate in turn is acted upon by second enzyme, phosphoglucomutase, also obtained from tissue extracts, which catalyzes the migration of the phosphate group from carbon atom No. 1 carbon atom No. 6 forming glucose-6-phosphate.

A third enzyme obtained in tissue extracts known as catalase is catalytic for the conversion of glucose-6-phosphate to fructose-6-phosphate. When this reaction reaches a state of equilibrium, about 80 per cent of the substance is present as the glucose ester and 20 per cent as the fructose ester. The compound

resulting is identical with equilibrium ester and small constituent of resting muscle and the end product of glycogen breakdown in dial and extracts of muscle, heart, and brain.

Because certain differences exist in the decomposition of the glycogen in liver extract and that in extracts of muscle it is necessary to consider these two processes separately. In liver extract glucose-1-phosphate and glucose-6-phosphate are reduced to glucose and inorganic phosphate. Liver in contrast to muscle contains phosphorylase which acts on the equilibrium ester to complete the process of blood sugar formation.

In muscle hexosemonophosphate is formed by esterification of glycogen with inorganic phosphate. In intact muscle the equilibrium ester under aerobic conditions is partly oxidized, not partly converted to glycogen, and under anaerobic conditions is transformed to lactic acid.

In glycogen synthesis the first step, which occurs only under aerobic conditions, is a phosphorylation of glucose and fructose which results in the formation of hexose phosphate. However the first products of this reaction have not yet been isolated. The completion of the process, namely the conversion of glucose-6-phosphate to glycogen, although not yet obtained in these extracts, has been demonstrated in intact muscle.

The possible influence of epinephrine and insulin on these enzyme reactions is suggested, and it is hoped that additional investigation of a similar nature may eventually lead to an explanation of the mechanism of action of these and other hormones. EDWARD W. GIBBS, M.D.

BROSTER, L. R. Differential Diagnosis of Cushing's Syndrome (Biosophilism) of Pituitary or Adrenal Origin. *Ann. Int. Med.* 940, 43.

In attempt to point out the difference between the pituitary basophilism of Cushing and the adrenocortical syndrome, Broster emphasizes the point that the entire matter of the pathogenesis and primary locus of altered physiology is still an open question.

The syndrome of Cushing is characterized by two prominent features—changes in the sexual sphere and disturbances of the metabolism. The typical patient is a young woman who develops hirsuties of the male type, experiences menstrual irregularity or cessation, and becomes permanently fat in an abnormal distribution. In the male there is similar abnormal adiposity, loss of libido, and a decrease in the size of the genitalia. Secondary changes, having a great variability, may take the form of low sugar tolerance, hypertension, erythrocytemia, cholesterolemia, and the appearance in the blood of stercorin.

The onset of the adrenocortical syndrome on the other hand, is less likely to be accompanied by gain in weight, though transitory or moderate gain is not unusual. The secondary metabolic changes do not appear in the female muscle. If development and secondary male sexual characteristics, typical of true virilism, all become prominent.

However, the onset and early phase of the two diseases may be very similar.

The author states that in the Cushing syndrome a typical basophilic hypophyseal lesion is present, and in Cushing's own series some of the patients showed adrenal hyperplasia as well. In 'basophilism' of the adrenal type, the pituitary gland contains no basophilic adenoma; the adrenals are typically hyperplastic, and the tumor cells, in those cases in which a frank adrenal tumor is present, give a positive ponceau fuchsin staining reaction. Other authors, as well as Broster, have found pregnenolone and among other ketosteroids also androsterone in the urine of patients suffering from adrenal virilism. Such substances are not found in the urine of normal persons or of patients harboring a basophilic adenoma of the pituitary gland. These abnormal androgens have been greatly reduced by the removal of one hyperplastic adrenal gland, and frequently alleviation of certain of the symptoms follows.

Two illuminating case reports are given, one concerning a young male with pituitary basophilism, and the other a young woman with hyperplasia of the adrenal glands.

JOHN MARTIN M.D.

Hamblen, E. C., Powell N. B., Cuyler W. K., and Pattee C. J. Oral Use of Pregneninonol in Functional Menometrorrhagia. *Endocrinology*, 1940, 26, 201.

These authors report observations made on 7 young women with functional menometrorrhagia who were treated with pregnenolone, a derivative of estradiol in combination with estriol glucuronide and estradiol. After the menometrorrhagia of these patients had been controlled immediately by either curettage or by the injection of estrogens and progesterone, oral therapy was begun directly. Estradiol was given orally in doses of 2,400 oral units (2 mgm.) daily for fourteen days. Beginning on the fifteenth day sodium estriol glucuronide or estriol glucuronide was given in daily doses of from 1,800 to 3,000 oral units simultaneously with pregnenolone in daily doses of from 40 to 160 mgm. The latter combination was given for from ten to fourteen days and was discontinued when bleeding began. Observations during 14 cycles were reported as follows:

The clinical tolerance to pregnenolone in doses as large as 160 mgm. daily for fourteen days was good, bleeding of cyclic character and of normal amount occurred during this treatment. Endometrial biopsies taken at the onset of each menstrual period showed some degree of progestational response with this treatment, i.e., a mixed endometrium was observed in approximately 14 per cent of the endometria before therapy and in approximately 54 per cent during treatment. This therapy produced no significant alterations in the urinary titers of sodium pregnandiol glucuronide and of androgens of the patients investigated. The number of observations are too few and the period of observation too short to draw any definite conclusions.

RULON W. RAWSON, M.D.

Iuzzo, G. Parathyroidectomy in Scleroderma (La parathyroidectomia nella sclerodermia). *Pedichia*, Rome, 1940, 47, 512, part 41.

Iuzzo describes 3 cases of progressive scleroderma in which parathyroidectomy was performed bilaterally in the first patient and unilaterally in the second, the immediate results being good but unfortunately only temporary. In the first case, the disorder presented the typical and not infrequent association with Raynaud's disease of the sclerodermic variety. The changes in the skin of the face appeared during a second stage when the fingers had already undergone severe alterations of the skin and of the nails with mutilation of the last phalanges over the course of many years. In numerous determinations the calcemic values had varied within wide limits, but had always been above the level which is considered as physiological. Study of the sympathetic nervous system had revealed a slight increase in the sympathetic excitability. In the second case also the calcemic values showed wide variations but always in a hypercalcemic sense. On the other hand the sympathetic nervous system was excitable especially in its parasympathetic section.

Parathyroidectomy was biochemically justified and offered the possibility of general and local amelioration because the cutaneous dystrophy, although typical, had not yet reached a stage that was too advanced and therefore irreversible. The resected parathyroids were found to be histologically normal. The immediate improvement of the cutaneous condition was more subjective than objective: there was a feeling of increased elasticity and softness of the skin, and of easier movements in the parts corresponding to the sites of the most marked changes; the skin of the hands could be lifted in folds to some degree. The calcemic values were not changed in the first case, but a decrease of about 20 mgm. per thousand without, however, reaching normal values was observed in the second case. The amelioration, which was very transitory in the first patient, has persisted for five months in the second, but is not fully confirmed by objective examination; further observation is needed to evaluate the intervals of relative well being.

It is difficult to offer a satisfactory explanation of the mechanism by which a decided feeling of improvement in the cutaneous condition occurs soon after the operation. This improvement, however, is not proportionately confirmed by objective findings. The theory that the amelioration is causally related to changes in the calcium metabolism seems to be denied by the present cases. Resection of one or more parathyroids in scleroderma has been performed in a sufficient number of cases to allow some theoretical and practical conclusions. In all cases but 1, the parathyroids were histologically normal. The intervention has not fulfilled the hopes founded on it. Besides, the increase in the calcemic rate, which led the first investigators to suspect a genetic relationship between a functional change in the parathyroids and scleroderma, is not the rule. Various

considerations suggest that there is not enough justification to consider human scleroderma as form of chronic hyperparathyroidism with cutaneous localization. Certainly the results of parathyroidectomy contradict any assertions of relationship between parathyroid dysfunction and scleroderma. The temporary improvement of the skin after parathyroidectomy is probably due to changes in the peripheral circulation determined by the sympathetic nervous system. It is possible that functional disturbance of the parathyroids may in some manner be connected with the pathogenesis of scleroderma in its various manifestations and complications, but it would be irrational to exaggerate its rôle by resorting to surgical interventions of doubtful value.

RICHARD KERR, M.D.

Galloway J D B Broder, A. C., and Ghormley, R. K. Xanthomas of the Tendon Sheaths and Synovial Membranes: Clinical and Pathological Study. *Arch. Surg.* 94, 4 435

Since 9 of 71 patients have presented themselves to the Mayo Clinic with one or more xanthomas of the extremities involving the tendon sheaths or synovial membranes. In this group 50, or 56 per cent were women, 20, or 28 per cent were men. The average age for the women was forty-five years, and for the men forty-three years.

The weight of each patient was determined to see if this group of patients were of an obese nature. It found that in 37, or 52 per cent, there was record of overweight with an average of about 4 lb over weight per patient.

There was specific history of trauma in 3, or 44 per cent of the patients. 4, or 56 per cent revealed the presence of arthritis in the involved extremity, and 6 patients had history of both infection and trauma, which makes a total of 39, or 55 per cent that had either an infectious or traumatic background.

In 6 patients there was a record of the duration of the tumor revealing an average duration of 2 1/2 years and one month.

In the 70 patients observed, there were 88 tumors. Sixty-five patients had 8 tumors of the tendon sheaths and 5 patients had 6 tumors of the synovial membranes.

The tumors of the synovial membrane were found in the knee and only 23 had diffuse xanthomas.

The history elicited was usually the same. The patients complaining of a slow-growing painless mass very seldom causing any disability except when the size was sufficient to produce mechanical block of the motion of the joint. Some of the tumors were preceded by injury, but often no history of definite injury could be determined.

On physical examination, the usual picture was that of subcutaneous, firm mass, of varying size and shape not tender on pressure and located in the vicinity of the tendon sheaths, or on them. The overlying skin was unattached but evidence of attachment to deeper structures was present. In 18 of

It was quite evident that the mass was tense to the touch, the motion of the tendon in the sheath as not hampered.

The results of the routine laboratory tests were essentially negative. With regard to the condition. Sixty-nine of the 70 patients were treated surgically at the Mayo Clinic. Sixty-seven patients were treated by local excision alone and 2 had roentgen treatment in addition to local excision. Roentgen treatment was given only in those cases in which it was believed that all of the tumor had not been completely removed.

Most of the tumors were quite easily shelled out intact and without much damage to the tissues.

Grossly these tumors appeared as round or oval, practically all well lobulated, well encapsulated, and masses, of moderately firm to quite firm consistency and of color varying from grayish-yellow to yellowish-brown and reddish-brown.

Microscopically their appearance varied. They were however, certain definite characteristics. They were nearly all found for example the foreign cells, foreign-body giant cells, pigment, and fat.

The type-cells of the stroma were the same in all instances. They are polyhedral, oval, or round, containing one nucleus that was usually quite large and either round or oval. Each nucleus stained lightly and contained one and sometimes two dark stained nucleoli. The cytoplasm of these cells took the eosin stain faintly and was of rather homogeneous and slightly granular nature. These cells looked not unlike endothelial cells and were arranged usually in solid masses, separated only by the interlacing strands of fibrous tissue. Some spindle cells were present in small numbers and very few polymorphonuclear leucocytes were observed in any one section.

Foam cells were found in all but 8 tumors. These cells are of varying size and shape. Their cytoplasm revealed a granular foamy appearance and their nuclei were smaller than those of the type-cells, having a shrunken, pyknotic appearance.

Giant-cells of the foreign-body type were found in all but one patient. They varied in size and shape but rectangular cells seemed to predominate.

There was evidence of good blood supply in all the tumors.

The authors conclude that xanthoma is a slowly growing painless type of tumor taking usually years to develop. Five years and one month on the average in those cases reviewed in the literature, five and a half years in their two cases. It causes no disability except when it reaches a size large enough to interfere mechanically with adequate motion of the joints or proper function of the extremities. It is of varying size and shape but in most cases is firm, round or oval lesion, varying in size from 2.5 to 3 by 1 cm. It is slightly smaller on the hands and fingers than on the feet and ankles. It occurs as often as on the extremity from two to three times as often as on the foot or involving the finger most frequently. It is most common on the index and middle fingers, as shown by both series of cases.

The authors say that given a man or woman about forty years of age, with a firm, oval or round, subcutaneous mass from 2 to 3 by 2 cm in size, located on or associated with a tendon sheath, preferably the flexor of the fingers, a mass that has been painlessly, slowly increasing in size, and, moreover, if the patient presents a history of previous trauma and his blood chemistry reveals an absolute increase in its lipoids or an alteration of the ratio of cholesterol to cholesterol esters, you will have, in all likelihood, a xanthoma of the tendon sheath.

This tumor must be differentiated from chondroma, which is harder, lipoma, which is softer, carcinoma, which usually affects the skin, osteoma, which is harder and connected with the bone, and from ganglion, which is usually on the extensor surface, near a joint, and softer in consistency. Tumors of the muscle must be thought of, and tendovaginitis and tuberculous dactylitis are possibilities which must be considered.

Since these tumors have been definitely proved to be benign without evidence of metastasis, the authors consider conservative surgical treatment to be the one of choice. Usually only a local excision is necessary, if a recurrence takes place (it does if the tumor has not been completely excised) a second excision should be performed. However, a limb should never be sacrificed for what appears to be a sarcoma at first glance. The actual value of roentgen therapy in the treatment of these tumors is still questionable, and in most cases very little, if any, response has been observed, however, this method will probably continue to be used as an adjunct to surgical removal and perhaps in the future might prove to be of benefit in those cases in which complete removal of the tumor is not possible.

Campbell, J. A. The Influence of Low Oxygen Pressure upon the Incidence of Primary Lung Tumors in Mice. *Brit. M. J.*, 1940, 1, 336.

The author reports a series of low oxygen-pressure experiments which seem to be the first of their kind to throw any light on the influence of low oxygen pressure in the atmosphere upon the incidence of primary lung tumors. These experiments were begun in London on December 9, 1936, and continued until September 2, 1939, when, unfortunately, at the outbreak of the war, it became necessary to discontinue them because of the danger of fire from the oxygen. During this period, however, some useful information had been obtained, which is recorded in the present paper.

Several observers have suggested, with respect to cancer in general, that tumors originate in cells suffering from oxygen deficiency, while others have found that general oxygen deficiency inhibits the growth of tumors but does not destroy the cancer cells completely. It is quite possible, however, that the origin of the cancer cell may be controlled by factors differing from those controlling the rate of growth of the resulting tumor. So far, most of the evidence tends to show that tumor growth is more

rapid in a host with favorable conditions as to general nutrition.

The author states that if low oxygen pressure plays a part in the production of so-called spontaneous tumors, then exposure of animals for long periods to an atmosphere with an abnormally low oxygen pressure should increase the incidence of the tumors. In the course of an investigation of the powers of acclimatization of mice to low oxygen pressure, an opportunity presented itself to study the incidence of primary lung tumors under subnormal oxygen pressure. It is a frequent observation that lung tumors in mice appear to originate in a collapsed or thickened area. It is presumable that the cells in the center of such an area might suffer from some degree of anoxia. This will be increased in degree if the animal breathes oxygen at a lowered pressure. Age has an effect on these lung tumors, which are rare in mice less than ten months old. This is similar to the findings pertaining to human lung cancer, in which the mean age at death is fifty-five years. The author states that obviously a man who dies of cancer of the lung is susceptible to it, and that therefore it serves no good purpose to use non-susceptible animals for experiments. Accordingly, in experiments with mice, attention should be directed particularly to the incidence of lung tumors in those which are older than ten months.

The author fully describes the methods used in conducting his low-oxygen-pressure experiments with mice placed in a respiration chamber and subjected to low oxygen pressure. The experiments were fully controlled by a number of mice placed in a similar respiration chamber and subjected to the same conditions except that they were exposed to normal oxygen pressure, namely 20.9 per cent of an atmosphere.

A record of the duration and percentages of oxygen pressure in the chamber with subnormal oxygen pressure brings out some interesting data. Mating of the mice was allowed, and it was found, upon lowering the oxygen pressure to 14 per cent of an atmosphere, that the females became pregnant but refused to rear their young. Therefore, the oxygen pressure was raised to 15 per cent and kept at this level for three hundred and fourteen days. After some time at this level the mice reared their young and a lowering of the oxygen pressure to 14 per cent was again instituted. After thirty-nine days at this level the oxygen pressure was lowered to 13 per cent, at which level it was maintained for three hundred and seventy-nine days, or until the experiments were stopped.

The results of these experiments, as far as they go, indicate that anoxia increases the incidence of primary lung tumors in mice older than ten months, and may therefore be a factor in the origination of tumor cells. The results also prove that it is possible to acclimatize mice to 13 per cent of oxygen, equivalent to an altitude of about 15,000 feet, so that they breed and rear young which grow at a normal rate under this low oxygen pressure.

MATHIAS J. SEIFERT, M.D.

Bade W: Metastatic Carcinoma of the Skin Following Carcinoma of the Internal Organs (Das metastatische Carcinom der Haut im Anschluß an Carcinoma innerer Organe) *Arch f Dermat. u. Syph* 939, 79 57

His own observation of carcinoma of the internal organs which metastasized to the skin, the author adds 53 cases gathered from the literature. Such a sequence was published the last time in 1931.

In the author's case a woman began bleeding twenty years after the menopause. She sought medical advice on account of the bleeding of knotty swellings in the skin of her abdomen. These tumefactions proved to be metastases of an adenocarcinoma. The patient died while the clinical examinations of her condition were being conducted.

Skin metastases appear clinically either as knotty or flattened sclerodermic-like infiltrations, and are most frequently multiple; they are partly cutaneous and partly subcutaneous. The skin is livid brown to dark red and ulcerates readily. The cancerous cells of the metastases retain the characteristics of the primary tumor. The diagnosis of a skin metastasis not infrequently leads to the diagnosis of the primary cancer even though in some cases the site of the primary tumor could not be established clinically. In recent years cases of skin metastases following genital carcinomas seem to appear more frequently. Why skin metastases occur in some cases is not yet understood. The summary of these cases offers very interesting details.

(Moscow-Ukraine) MATTHEW J. SEIFERT, M.D.

Peller S. Life Expectancy and Mortality from Skin and Lip Cancer. *Am J M Sc* 946, 99 449

In order to estimate the life-shortening role of skin and lip cancer one can depend less on the causes than on the frequency of death and on the time elapsed since the onset of the illness. In this paper such an attempt has been made. The author studied 75 cases; all were included, whether treated or not.

The following conclusions are made:

At the onset of the disease, carriers of an epithelioma of the skin or lip are about as old as the average of all other cancer patients. At the time of death they are older. The influence upon the life expectancy and mortality depends on the age at onset. Patients with skin and lip cancer less than sixty years old had in the author's material an increased mortality and shortened life expectancy as compared with the average population at the same age. Patients with onset of the epithelioma at ages above seventy years had lower mortality and a higher life expectancy.

At the beginning of the cancer age, at forty, the total group of future carriers of surface cancer have most probably a future life surplus, compared with the total population of the same age. This indicates that the primary internal cancers developing in those who already have or have had surface cancer are not frequent enough to diminish the life expect-

ancy in this group or to frustrate the value of therapy of the surface malignancies.

JOSEPH K. KATZ, M.D.

Payton W T: Danger in the Use of Local Infiltration Anesthesia in Operations upon Malignant Tumors. *J Surg* 940, 455

There are certain clinical procedures, such as when improperly performed may tend to produce metastases, i.e., biopsy palpation of tumor, and operation for removal of tumor. The clinical impression has been gained that local infiltration anesthesia may occasionally cause dissemination of malignancy. This impression came from the occasional case of carcinoma which developed an extensive local dissemination or metastases to regional nodes after operation under local infiltration anesthesia.

To check this impression, animal experiments were carried out by inoculating various tumor bits into mice and when the tumors had reached a proper size they were divided into control and experimental groups. The tumors in the control group were removed under general anesthesia at approximately the same interval after inoculation as the tumors in the experimental group; the latter also being removed under general anesthesia, but in addition 1 c.c.m. of a 0.5 per cent solution of novocaine was injected about the tumor in the experimental animals.

The experiments would seem to indicate that the common surgical practice of using local infiltration anesthesia for biopsy or removal of malignant tumors is a dangerous procedure and should be discontinued.

JOSEPH K. KATZ, M.D.

Dodd, H. Drugs Used in Surgery to Raise the Blood Pressure, with Special Reference to Ventol. *Lancet* 940, 35 358

Coramine, adrenaline, koral, ephedrine, ephedrine, and cortis have been employed for elevation of the blood pressure during surgical procedures, but except for ephedrine their use was not suitable. Despite the need for repeated intravenous injection of ephedrine, it remained the chief remedy until something better was found.

Ventol (β-p-oxyphenyl isopropylmethylamine) has proved most satisfactory for raising the blood pressure. It may be given intravenously, intramuscularly or by both methods. The dose for intramuscular injection is from 0.75 to 1.0 c.c.m. The blood pressure begins to rise in from three to five minutes and reaches maximum in twenty minutes. The fall from this level takes place during the second or twenty to forty minutes when the dose may be repeated. If severe shock the dose may need to be 5 c.c.m.

A dose of 5 c.c.m. given intravenously will give response within fifteen seconds. The effect is quick although the subsequent fall is quicker than following intramuscular injection, so combined dose is employed. A 5 c.c.m. given intravenously and 11 c.c.m. given intramuscularly.

Cardioid and veritol have been given together in patients who are cold whose pul are dusky who e systolic pressure is near or at the diastolic level and whose pulse is weak.

Hypertonic saline solution (40 per cent) has also been used effectively in raising blood pressure after the use of spinal anesthesia.

JOHN WILSON LEON, M.D.

GENERAL BACTERIAL, PROTOZOAN, AND PARASITIC INFECTIONS

Carroll G. Kappel, I. Jones, I. Gallagher, F. W., and DiRocco, I. W. Sulfamethylthiazol. A Report of Its Clinical Use in Staphylococcus Septicemia with Apparent Success. Report of Animal Experiments. *South. M. J.* 1940 33, 84.

The authors report for the first time the successful use of a sulfanilamide derivative, sulfamethylthiazol, for combating staphylococcus aureus infections and septicemia.

There have been a few reports in the literature of recovery from staphylococcus septicemia with the use of sulfapyridine. According to Perrin Long, who reported the first use of sulfanilamide against the streptococcus, the use of sulfapyridine is only mildly effective in staphylococcus bacteremia. In the group which he reported 3 of 5 patients with this disease recovered.

Five cases are reported here, that of an elderly man with staphylococcus aureus infection of the kidney. Consecutive trials of mandelic acid, sulfanilamide, and sulfapyridine produced no change in his toxic state. At operation a diffuse infection of the perirenal tissue was found, there was drainage of thick yellow pus. On the fourteenth postoperative day sulfamethylthiazol was given in doses varying from 6 to 14 gm. daily. After medication for twenty days with this drug the urine became negative. Rapid defervescence of the disease occurred. According to the authors, at no time was a positive blood culture obtained.

In 2 cases which were classed as mild pyelonephritis due to staphylococcus aureus, negative urine cultures were obtained after one week of use of this drug. These ambulatory cases showed no toxic symptoms of the drug.

One case of staphylococcus septicemia in a young woman who developed a breast abscess during the puerperium was first treated with sulfanilamide with no relief. After blood transfusions together with soluble sodium sulfamethylthiazol administered intravenously, the blood culture became negative and recovery occurred.

In the fifth case, that of a ten-day-old male infant, staphylococcus septicemia developed from an infected umbilicus. No effect was produced by neoprontosil or by sulfapyridine. The septic process involved the left knee joint, right shoulder joint, and right hip joint in succession. Sulfamethylthiazol was given, and septic symptoms promptly subsided within twenty-four hours. The infant recovered, but

when last seen had a necrosis of the head of the right humerus.

The authors carried out experiments on mice. The animals were given intravenous injections of virulent staphylococcus aureus. The result was that about 70 per cent of the animals given sulfamethylthiazol or its sodium salt had a survival time of fifteen days, whereas in the non-medicated animals the average survival time was from three to four days.

In the discussion Carroll points out that very thorough animal and test-tube experimental work had been carried out in the research department of the Winthrop Chemical Company, and the workers had administered 4 gm. daily of the drug to them daily without deleterious effects.

JOHN I. KIRKPATRICK, M.D.

DUCTLESS GLANDS

Collier, J. B. The Physiology of the Anterior Pituitary and a Note on the Medullotrophic Hormone. *Br. J. Obst. & Gynec.*, 1940 49, 187.

The number of true anterior lobe hormones must be very small, which is in keeping with the anatomical nature of the factory which produces them. The author lists 15 physiological effects attributed to the pituitary gland. All of the physiological activities of the anterior lobe are represented by different groupings in two or three protein substances secreted by the gland. Growth of various organs may be largely independent of the pituitary growth hormone and the function of the latter would seem to be the regulation of the increase in the size of the body as a whole with a harmonious and proportional increase in the size of all the organs. Since no absolutely pure growth hormone either in the chemical or the physiological sense has been obtained, it is difficult to decide just what physiological effects are related to this substance and not to any other.

A clinical trial of the specific metabolic factor in a small group of obese women showed some rather unexpected results. It so happened that most of the subjects treated had some degree of menstrual irregularity, and in 4 of 8 cases treated the patients stated, without any leading question, that it was the first time in years that they had noted any regularity at all.

Probably the most important of the investigations relating to the physiology of the pituitary gland led to the finding of a medullotrophic principle in primary alcoholic extracts of prime gland tissue. This principle has also the remarkable quality of being active orally. It appears to be trophic to the so-called "dark cells" of the adrenal medulla. All of the evidence so far available seems to show that this orally active pituitary principle does not act upon the chromaffin system. Since potent preparations of the corticotrophic hormone satisfactory for administration by injection to the human subject can now be made, and since the medullotrophic substance can be administered safely by the oral route, the clinician will have two agents, each of which can

be biologically standardized, with which to influence at least two functions of the adrenal glands.

EDWARD L. CORRELL, M.D.

Copplehall, C., and Root H. F. Acromegaly and Diabetes Mellitus. *Endocrinology* 1940, 26

Twenty nine cases of combined acromegaly and diabetes are reviewed. An average interval of nine and two-tenths years was found between the onset of acromegaly and that of diabetes. The existence of hereditary or familial diabetes in 6 of the 30 cases, or 2 per cent suggested a predisposition to diabetes. Among relatives of 137 non-diabetic acromegalics, history of diabetes could be obtained only in 1 per cent of the patients. 1 group of patients with acromegaly, diabetes, a combination of both conditions, and Simmonds disease, comparative studies of the weights of organs at autopsy showed acromegaly only in the presence of acromegaly. The possibility of permanent damage to the island of Langerhans as the result of a brief period of acute hyperpituitarism is admitted, although in 4 cases of fugitive acromegaly caused by mixed pituitary tumors diabetes failed to develop. 150 topies of diabetes variations in the size of the pancreas were not associated with variations in the weight of their internal organs, as was the case in acromegaly and Simmonds disease.

Clinically the diabetes in acromegalics showed no greater variations in severity, duration of life, or revert once to normal, than were observed in large group of ordinary diabetics. The usual complications of diabetes occurred. It was noted that in patients who had repeated insulin reactions, blood sugar curves might suggest insulin "sensitivity." Some acromegalic diabetics developed coma, other individuals with polyphagia, but with no loss of weight or edema, had diabetes not unlike that produced in dogs by Young by means of the injection of large amounts of crude anterior pituitary extract from the ox.

WALTER H. NADLER, M.D.

Turpin R., Chassigne, P. and Lefebvre, J. Prepubertal Megalothymus: Planigraphic Studies of the Thymus in the Course of Development (La mégalo-thymie prépubertaire: étude planigraphique du thymus au cours de la croissance). *Ann d'endocrinol* 1939-1940, 33⁵

For long time anatomists have thought that the thymus reaches its maximum weight at the end of the twelfth year. After this there is rapid regression. However, more recent researches coming from different sources and based on the results of the comparison of a number of eight have shown that this was incorrect. In fact the weight of the thymus, instead of diminishing at the end of the twelfth year, increases during the course of development and reaches its maximum at the moment of puberty. After that it diminishes in size rapidly. Nevertheless, in spite of this increase in size the thymic development remains always proportionately less than that of the organism in general.

The error of the classical anatomists and the long incertitude relating to thymic evolution are re-understood if one bears in mind the extreme activity of this gland. It is well known that it is remarkably influenced by the vicarious processes and in addition by a thymic involution and chronic atrophy. Its size decreases rapidly under their influence. After recovery has taken place however the thymus regains its normal weight and its entire spectrum existed before illness. These physiological and pathological variations of the thymus explain the errors of many of the previous investigations. It is only by exacting the normal variations of the thymus in the course of development it is necessary to study only normal children, whose height and weight correspond to the normal average for that age and whose state of nutrition is altogether satisfactory.

The difficulties of roentgenological interpretation of the thymic shadow are well known. Because of its position and its variations in size (it may be coughed up and down) respiratory marked variations are observed. For this reason the authors reserved the planigraphic method of study of the thymic shadow during the course of development. They used the planigraph of Zuercher des Plantes and describe their technique in detail. While approximately 200 children are studied by this method, the present report deals with 83 of which are boys and 17 girls.

The authors conclude from these studies that in its normal state the thymus is accessible to planigraphic examination. In certain precocious conditions they indicate are observed, thymic measurements of the shadow obtained in both boys and girls from two to fifteen years of age can be measured and graph made which parallels those variations found in the measurement of the normal organs. It is during the same period by the anatomist. The planigraphic method shows that the course of the thymus increases during the course of development. This increase is discontinuous. It precedes the postnatal development of the organism. It reaches its maximum at the moment of puberty and it proves that these are so sharply marked that one can speak of prepubertal megalothymus. This prepubertal megalothymus goes along with the adiposity the hyperthroid function, and the other developmental potentialities of this age. One of the observations that accompanied the precocious puberty seen in girls who at six years and nine months of age. The maximum is still slower in boys than in girls.

The authors describe the main types of thymic shape: the prepubertal megalothymus, one like heart and the other like trapezoid. These special disappear one or two years after puberty. In the adolescent the thymic shadow is confused with the mediastinal vascular shadow.

The report is accompanied by several detailed planigraphs and typical roentgenographic illustrations of the various types of thymic shadows encountered.

NATHAN A. WOLKOFF, M.D.

been markedly decreased in a short time. In none of the 50 cases so treated was there any pulmonary embolism. In 600 cases of thrombophlebitis not treated with heparin the incidence of pulmonary embolism was 15 per cent.

The reasons for these improved results are not easy to determine but they seem no less definite on that account. The average case was treated with heparin for about ten days. In some cases this was continued longer before the temperature returned to normal. After four days the patient is advised to move actively around in bed, and after two days more he is given active exercise in preparation for getting up. He is gotten up between the tenth and the twelfth day and if there is no recurrence of temperature, he is allowed to leave the hospital.

It is in pulmonary embolism that this material appears to give some of its most dramatic results. Twenty-two patients were treated with heparin, and none died of embolism though death seemed imminent for some. Symptomatically and clinically they showed marked improvement. Two patients who had pulmonary embolism and were treated with heparin died and autopsies were made. The death of one was clearly due to peritonitis. The other had recovered from his embolisms sufficiently to leave the hospital and return to work, but subsequently he had to be operated upon for an intestinal obstruction. Because of the fact that he also had a bleeding duodenal ulcer at this time, it was deemed inadvisable to administer heparin, and he promptly died of massive pulmonary embolism following the second operation.

In cases of mesenteric thrombosis and splenectomy, the material has been used to apparent advantage. Four patients recovered from the first condition while 2 who failed to survive showed no increase in the thrombosis at death. The deaths were attributed to peritonitis. Portal thrombosis which is a serious complication in splenectomy was not noted in 8 cases when heparin was used, 2 patients died but at autopsy no thrombosis was seen.

In postoperative cases, heparin is ordinarily not given for from four to twenty-four hours, in order not to encourage bleeding from the wound site. The injection is then continued until the patient has regained normal activity, i.e., when the factors thought to contribute to the production of thrombosis have ceased to act. This time has been reached when shock has passed and the blood pressure and circulation are normal, the incision has healed and is not painful so that deep respirations are possible, the patient feels well and energetic and moves about actively in bed, and can exercise, distention is gone, the appetite has returned and the gastrointestinal and urinary functions have returned to normal, the chest is clear, and the temperature and pulse have returned to normal. Before starting treatment, the blood clotting time, prothrombin index, platelet count, bleeding time, and other ordinary blood analyses must be ascertained.

JOHN WILTSIE EPTON, M D

Lipschuetz, A., and Vargas, L., Jr. Tumorigenic Powers of Stilbestrol and Follicular Hormones. *Lancet*, 1940, 238, 541.

The authors had shown previously that stilbestrol was capable of forming small fibroid tumors in the uteri of guinea pigs when the substance was administered over a prolonged period of time. In the present work the tumorigenic action of stilbestrol was compared with the similar action of natural hormones, i.e., estradiol and estrone. Stilbestrol was found to possess a greater action in the production of these small fibroid tumors than the natural hormones, but this action was about the same as that obtained with certain esters of estradiol.

The authors are of the opinion that stilbestrol is inactivated by the organism at a much slower rate than are the natural hormones, and is consequently more toxic.

LUTHER H. WOLFF, M D

Brues, A. M., Marble, B. B., and Jackson, E. B. Effects of Colchicine and Radiation on the Growth of Normal Tissues and Tumors. *Am J Cancer*, 1940, 38, 159.

The use of colchicine produces pronounced effects, such as arrest of mitosis and various other cytological abnormalities. The fact that it disturbs the process of mitosis has led some investigators to believe that it might be valuable in the therapy of tumors. Considerable doubt exists, however, as to the influence of this alkaloid on the total growth when it is administered chronically. The results of investigations thus far appear somewhat contradictory. While some investigators report encouraging results following the use of colchicine in the case of experimental tumors, others report that colchicine fails to affect tumor growth.

The consideration of this problem is further complicated by the fact that colchicine has a two-fold action, namely, a stimulating action as well as a destructive action, a mitotic as well as a toxic effect, which may be entirely dissociated. It is well known that colchicine in sublethal amounts produces hemorrhages in various organs. This is true especially in experimental sarcoma. Thus, the regression of the tumors may be the result of hemorrhagic processes and may bear little relation to the inhibition of mitosis. In the presence of both stimulation and destruction, either hypertrophy or atrophy of the tissues could occur.

In the present study the authors have sought to determine the effects of daily treatment with colchicine upon the growth of tumors and regenerating tissues in experimental animals, using for this purpose both mice and rats. There is a narrow range of dosage for colchicine which brings about the characteristic effect upon cell division and which may be administered daily without causing death. The authors used corresponding amounts in their experiments. The effects of radiation in combination with the use of colchicine were likewise studied. The probability that cells are most susceptible to the effects of roentgen radiation at some stage of mitosis

toxin Suda III stain of the scrapings of the thyroid gland was always made.

The liver extracts when obtained from healthy cattle and pigs, were positive in the dove test if the injected quantity was not below 5 mgm. The yield obtained from the liver of cattle is about 100 times greater than that produced by the pituitary body. The yield of livers of horses (old & sick?) was always negative. A method in accord with that of Riddell and Bates for the preparation of the hormones was given in detail. On the basis of the reported results of the chemical analyses, and the agreement of biologically proved results the authors believe that the lactation hormones from the anterior lobe of the pituitary body and those of the liver are probably identical. (HERRINGHILL) MATTHEW J. SEXTON, M.D.

Eldelsberg, J. and Ornstein, E. A. Observations on the Continued Use of Male Sex Hormone Over Long Periods of Time. *Endocrinology* 940, 16 46.

Clinical results are briefly reported in the cases of 4 young men who had infantile genitalia and complete lack of libido and erections 3 of these had undescended testicles. After treatment with testosterone propionate there are symptoms and signs of masculinity and the general well being, strength, and mental state improved markedly. On several occasions, because of too numerous erections and too pronounced libido, the dose or frequency of injections had to be decreased. No ill effects were noted. The average maintenance dose seemed to be between 50 and 75 mgm. per week, with individual variations. The patients were taught to administer their own injections after attaining the maintenance dosage. In 3 cases the prostate increased in size. A visible enlargement, but with no abnormal increase in size of the penis, occurred in each instance. Thyroid administration was more effective during the use of testosterone. The authors mention that sterile compressed, pure testosterone-propionate tablets implanted under the skin were still effective after a period of from eight to ten weeks.

WALTER H. NADLER, M.D.

McCullagh, E. P. and McGuff, F. J. The Effects of Testosterone Propionate on Epiphyseal Closure, Sodium and Chlorine Balance, and on Sperm Counts. *Endocrinology* 940, 10 377.

These writers state that until 1938 they had never seen epiphyseal development in eunuchoidism which advanced beyond the normal rate with testis hormone. However recent observations on three eunuchs treated intensively with testosterone propionate revealed epiphyseal union which took place at a more rapid rate than normal. One patient who had received from 50 to 60 mgm. of testosterone propionate per week for a period of five months showed no advance bone age, whereas when the dose was increased to 75 mgm. and maintained for eight months, the bone age advanced three years.

Two eunuchs were observed for weight gain, sodium chloride, and nitrogen excretion during a three day control period and for six days following the administration of 50 mgm. of testosterone propionate. A gain of 4½ and of 5 lb. respectively was observed. It must be noted, however, that the patients were receiving 335 calories daily. There was marked diminution in the urinary sodium and urinary chloride following treatment, the amounts of the sodium being more marked than that of the chloride. A change as observed in the nitrogen excretion.

In each of these treated cases there was decided diminution in the total number of sperm produced during treatment.

These writers who warn against the injection use of larger doses of testosterone. They point out that large doses in immature individual may produce early epiphyseal union and subsequent dwarfing. They suggest that the same result might be obtained with the use of any substance capable of stimulating the testes to produce larger than normal quantities of androgens. They also point out that caution should be exercised when fertility is to be preserved because of the fall in sperm production observed in patients who have been treated with this drug.

WILLIAM W. RA, M.D.

EXPERIMENTAL SURGERY

Murray, G. D. W.: Heparin in Thrombosis and Embolism. *Brit J Surg* 940, 7 397.

With the marked improvement in the diagnosis and purification of heparin it is decided to determine the effect of its use on experimental and clinical cases of thrombosis and embolism. In cases of artificially produced injury to veins, there was very marked decrease in the number of sites which showed thrombosis. Moreover in cases of arterial and venous grafts, there was a very large percentage of satisfactory result without signs of intravascular clotting. When heparin was used in many cases of thrombosis were reported. One venous graft in the popliteal space in human being was made possible through the use of heparin.

In more than 400 cases, heparin has been employed and the results cited would tend to substantiate the claim of its value in clinical practice. It has been successfully employed to prevent thrombosis in vessels receiving continuous intravenous medication in the follow-up care of arterial embolotomies in thrombophlebitis, and in pulmonary embolism. Twelve cases of arterial embolotomy are reported which were carried out successfully with its use. The arteries of patients who died were carefully examined and the intima as found to be quite free of clot. This is in contrast to the usual experience, in which the greatest danger of the operation lies in the reformation of thrombotic material. In the case of thrombophlebitis, however, some of the more striking clinical results have been noted: the pain, temperature, and swelling has

report to the surgeon. The following are most commonly seen

1 Discharge. This is unilateral, usually thin, purulent, and slightly blood stained. The finding of a blood stained fluid on antral lavage must always be considered suspicious

2 Obstruction of one nostril. This is usually a late complaint, but may be early. It is not commonly due to actual invasion by growth into the general nasal cavity, but to surrounding edematous tissues, or to large myxomatous polyps following secondary infection. The sudden appearance of any type of polyp with epistaxis should arouse suspicion, and a careful investigation should be made

3 Pain. This is not usually a prominent symptom in the early stages. It occurs in the trigeminal area, and most often in the infra-orbital part of the maxillary division, being felt on the face and alveolar margin. It may be intermittent, sharp, stabbing in character, due to nerve irritation, or dull and boring, due to erosion of the bone

4 Hypoesthesia and anesthesia. These may occur in large or small patches over the cutaneous and membranous areas supplied by the maxillary nerve. They may be early signs. The reaction to pin prick should always be tested on the face and hard palate

5 Epiphora. Sudden increase in the lacrimal flow may be an important sign. Growths originating in the anterior maxillary ethmoidal region cause this complaint

6 Expansion of the antral walls. This may occur early or late, but it is a bad sign. Any of the six walls may bulge out, or several may be involved simultaneously. As a rule, the growth erodes the bony wall and invades the neighboring structures. Expansion of the cavity without bone erosion is usually considered diagnostic of a benign tumor. The diagnosis rests between an inflammatory condition, a benign tumor, and a malignant disease arising in the nose, nasopharynx, and palate

The consensus of opinion is that the outlook is grave in early cases, and hopeless in late cases. In the former, large doses of irradiation should be given in combination with adequate surgical removal and drainage. It is impossible to be dogmatic about how much this surgical step involves, but it should include palatal fenestration in most instances. Whether irradiation should be given before the operation depends on the type of growth and its extent. It is likely that preoperative irradiation will in future be given more often and in larger doses. It must also be remembered that many patients will apparently be hopeless conditions have survived longer than expected and in much greater comfort, because treatment has not been denied, this entails drainage operations to combat septic absorption, and irradiation to decrease pain

Improvements in radiotherapy offer the most hope of better results, radical surgery alone cannot cure more than a few cases, and "partial" surgery plays only an assisting, although necessary, part

Even if diagnosis be made much earlier so that small, localized, and "operable" growths are found more often, there is no doubt that the surgeon and the radiotherapist must still work together

SAUEL KAHN, M D

Ganter, H. A Contribution to the Technique of Bone Transplantation in Defects of the Mandible (Beitrag zur Technik der Knochen Transplantation bei Unterjocherdefekten). *Plastische chir*, 1940, 1: 113

In 96 per cent of 300 cases of bone transplantation for defects of the mandible the results have been successful. In only 4 per cent was the transplant removed, and in these a second operation was successful. These good results are believed to be due to careful asepsis, the provision of normal physiological conditions for the transplant, and the fact that the jaw bones were kept in a healthy state. Atrophy was minimal and the transplant rapidly adapted itself, particularly when so placed that it fulfilled a functional need

In cases in which there was no loss of substance, but the fractured bones overrode one another and formed a pseudarthrosis, it was necessary only to free the ends of the bone and suture them with catgut or lock suture in position. The periosteum was so sutured that it did not overlie the bony junction. Healing occurred rapidly

The preparation of physiological conditions for the bone, and later the transplant, begins with the care of the initial wound. Dead spaces are packed open and allowed to heal as early as possible. Sometimes one can freshen the edges of the wound and suture primarily, the bone fragments being buried deep in the wound where they are well nourished and will heal spontaneously. The wound is drained either inside of the mouth or outside. This early closure of the wound prevents deeply depressed scars which may extend between the bones and hinder union

The suturing of the tissues alone is not enough and a hindered union is not enough. The bone fragments must be immobilized for proper union, either by wiring of the teeth, if present, or by dental splints. Splinting is difficult if the ramus of the edentulous jaw is pulled forward by the muscles of mastication. The use of an impression splint between the posterior fragment and the maxilla is preferred as scar contracture is prevented and the jaw bone and muscle yield readily. The combination of the splint inside and the sutured wound outside will produce union or if the loss is great will maintain good condition of the bone for future transplantation

When the general condition of the patient is good, transplantation is done. Asepsis is essential and any accidental opening into the mouth is reason to stop the operation. The jaw is operated upon first through a curved incision a skin flap is raised. The subcutaneous tissue is incised at a different level to avoid superimposed suture lines. The bones are exposed and the ends shaped. The transplant is cut

led the authors to investigate the effect of daily irradiation of tumors at a time when the numbers of mitoses arrested by colchicine were presumably at their height. While the study was in progress it became evident that a notable retardation of tumor growth as effected by the colchicine and the authors concluded that the results might be due to fallure of the drug to penetrate into the deeper part of the tumor tissue since it had been previously determined that the cytological effects sometimes manifested themselves only at the periphery of large tumors. In one group of experimental animals therefore the authors performed successive radical operations in an effort to effect recurrences and metastases growing from small nests of cells.

It is presumably the drug might readily penetrate in investigation of the content of reducing substances in chronically treated tumors was also made in order to corroborate or deny the assertion of other investigators that a notable reduction of ascorbic acid is found in tissues and tumors of animals receiving large doses of colchicine. The authors present a complete description of the number and kind of experiments undertaken, together with the technique employed in each instance and the type of response observed in each group of experiments.

Their results emphasize the fact that the treatment of tumor-bearing rat and mice with maximal sublethal daily dosage of colchicine throughout the life of the animal produces no evidence of retardation of tumor growth or of prevention of recurrences or metastases after tumor excision. These smaller doses produce profound alterations in the mechanism of mitosis, notably the arrest of many mitoses at the metaphase. While these doses may be given daily covering a long period of time, they do not cause a regression of the neoplasms. Moreover they consistently failed to bring about any significant changes in the growth rates of the tumors studied. Likewise, it has appeared that there is no retardation of cell multiplication in the course of recovery from partial hepatectomy following the continued administration of colchicine. What is more any retardation of cell multiplication does not manifest itself until the animals are near death and sections of liver tissue show evidence of tissue damage. Cell multiplication in the course of liver hypertrophy under similar

conditions of dosage frequently continues at a normal rate and appears to do so in the complete absence of normal karyokinesis.

With reference to large doses of colchicine however the authors were able to verify the observations previously made that colchicine retards tumor growth. The authors consider as large doses those which are dangerously close to the lethal dose, which cannot be repeated daily with impunity and which cause hemorrhage and metabolic changes in tumors.

The experiments further established the fact that colchicine has no effect on the radiation response. The absence of synergism between colchicine and radiation indicates that cells resting in an abnormal metaphase are not particularly susceptible to destruction by the roentgen rays. Leaving aside any decision as to whether the regression of tumors is due to the direct effect of radiation on mitosis or to more complex circumstances, the authors point out that their data show that colchicine does not even decrease the latent period between irradiation and the various stages of regression, as might be expected if regression depended upon the destruction of cells which were in mitosis at the time radiation was given.

Analysis of tumor tissue for ascorbic acid showed no striking difference between the groups which were treated with colchicine and the control groups. The ascorbic acid fraction appears to have been lowered in irradiated animals.

The authors state that the present study cannot establish, wholly aside from the question of initial stimulus on inhibition or nuclear death that cell increase over a prolonged period may occur at a normal rate with colchicine as if this were regulated by normal metabolic influences or at least undisturbed by the changes in nuclear division. It is suggested that the growth rate may be altered from the normal metabolic state broken down, as reflected in the decreased vitamin-C content of tissue after large doses. It is believed that the apparent arrest of mitosis in the tissues studied is in reality only prolongation, and in some cases modification of certain stages of cell division which leads to increased multiplication of cells over a prolonged period.

ALFRED J. SCOTT, M.D.

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conservative external operation, the principles of which were laid down by Howarth. "The chief object is to drain the sinus whilst preserving its mucous membrane as far as possible," and "to regard the ethmoid as the key to the frontal sinus."

Matus states that the fundamental features of the modern conservative external operation include a small incision in the mesial wall of the orbit, the removal of the sinus floor, radical ethmoidectomy, and the establishment of good communication between the frontal sinus and the nasal cavity. To operate according to the modern principles mentioned above, he employs the sub-periosteal approach, the principles of which are based on the subperiosteal approach under the soft tissue, similar to the submucous approach by septum-resection.

The majority of intranasal operations should be followed by rapid recovery without any complications if the usual precautions, operative and post-operative, are observed. In surveying the complications of intranasal surgery, Davis calls attention to the following injuries to the neighboring structures which have occurred in spite of the careful technique and injuries to the roof of the nose or cribriform plate, injuries to the orbit and its contents, injury to the optic nerve, and injury to the nasolacrimal duct.

The persistence of pain—ever a disconcerting problem to the rhinologist—following radical operation upon the paranasal sinuses has been the subject of an investigation by Shillern. A tabulation compiled from reports by 16 rhinologists has the following causes for the persistence of pain, in the order of frequency, incomplete operation, disease elsewhere in the sinus system, systemic diseases causing symptoms of sinusitis, synchia or scar tissue blocking drainage or encasing the nerve, painful connection of the nerve, operation on the ethmoid and turbinate for insufficient reason, individual (neurvous) reaction, neuritis of the fifth cranial nerve, and atypical neuralgia of unknown origin. Further, Shillern believes that the persistence of pain following radical operation on the frontal sinus may be due to failure to remove every vestige of infection, local-intranasal or osteomyelitis as an infection from overlying sinuses, and infection of adjacent ethmoid cells. In the ethmoid capsule and sphenoid sinus the persistence of pain is due to retention of pus in the foramen, direct injuries to the nerves or blood vessels, the proximity of the meninges, and to localized meningitis or osteomyelitis.

Sinusitis in children. Recently, sinus disease in children—a subject that has been surveyed inadequately by rhinologists, pediatricians, and general practitioners for many years—has begun to attract thoughtful consideration. Since children are particularly prone to recurring attacks of upper respiratory infections, it can be readily surmised that extension of a nasal infection to the sinuses often takes place. However, it is only relatively recently that cognizance has been taken of the fact that persistent purulent nasal discharge may be something more than a "cold." In outlining his experience with sinusitis in children during a period of some twenty years, Mitchell states that allergy predisposes the sinuses to infection because of the stasis and blockage it produces. He finds that chronic maxillary sinusitis may require a naso-antral window operation. Many of the patients, treated in collaboration with Shea, were subjected to this procedure, as well as a series of autogenous vaccines given after the operation.

Reliance on roentgenograms, diagnostic puncture of the antrum, and bacteriological study of the secretions for the diagnosis of sinus disease are part of a well planned approach now employed by Looper, Crooks, Bowen-Davies, and Strachan. It is possible to employ a local anesthetic when irrigation of the antrum of children who are more than six years of age is performed. Should the child prove uncooperative, Lindsay advises making a window into the antrum. Occasionally the middle turbinate is impeded to improve drainage. When pus is present in the antrum, Bettington performs a naso-antral window operation, using a punch forceps rather than a rasp. The usual objections to radical operation on the antrum of children are invalid, Alcockhurst finds, if the opening is made sufficiently high and drainage of the antrum is avoided.

In a study of the relation of upper respiratory tract infection to early bronchiectasis in children, Cobb and the results of post mortem examination on 200 children dying of pneumonia and found that it is important in 43 per cent. He stressed the importance of early diagnosis of bronchiectasis and the removal of connection of the sinuses.

Loy and Engel maintain that acute osteomyelitis of the superior maxilla in children requires early operative intervention. Drainage should be established primarily through the mouth and secondarily through the antrum. Alcockhurst maintains that a cause of the osteomyelitis rather than a cause of it. In their opinion the prognosis is not bad when there is early surgical treatment.

ly ing pathological processes is necessary before resorting to surgical intervention. The diagnosis should be accurately established on the basis of the clinical history and course, the roentgenogram, and other laboratory findings, particularly the bacteriological and cytological study of the nasal and sinus secretions. In the final analysis and evaluation of the indications for surgical procedures in sinus cases, Hansel maintains that the possibility of the allergic factor always exists and the question of primary importance is whether the pathological conditions in the nose and paranasal sinuses are the result of a pure allergic process, a primary infection, or a combined allergic and infectious condition. In general, the results obtained from surgical procedures on the nose and paranasal sinuses in allergy have been unsatisfactory, although surgical removal of polypoid tissue may often be necessary.

When results were good they frequently were on the basis of trauma and non-specific reaction. Porter claims that rhinologists when thorough in their surgery and in their after-treatment can do more for certain patients than the allergists can. Allergy is undoubtedly important, but at best it appears to be a highly speculative subject, grossly overrated, overemphasized, and underdiagnosed. For no matter how enthusiastic one may be about allergy, patients still become ill from other causes.

Mitrohofer believes that a rapid surgical approach in chronic cases is often a great mistake. When surgery is necessary, its success will depend on the ability of the surgeon to detect every affected sinus, and his accuracy in removing all of the diseased mucous membrane. In the extreme winter months Tivnen advocates the postponement of surgical procedures of a radical type, especially if epidemics of the upper respiratory tract are present. Montgomery declares the following to be the reason for the failure of sinus surgery: inadequate elimination of all etiological factors, allergy superimposed upon infection, too much or too little operation, and failure to stress diet, endocrine factors, and intestinal stasis.

Maxillary sinus. The accessibility of the natural ostium of the maxillary sinus has been a controversial issue for many years. Although irrigation of the maxillary sinus through the ostium is by no means new, increasing attention has been directed more recently to this form of treatment of maxillary sinusitis. In an exhaustive anatomical study of the surgical accessibility of the maxillary ostium Van Alyea demonstrated that the ostium or accessory opening was easily

accessible in 54.5 per cent of his 163 anatomical specimens, in 32 per cent it could be entered with difficulty, and in the remaining 13.5 per cent it was entirely inaccessible. Rosenberger and Mierici reviewed their experiences with natural or accessory ostium irrigations and found them preferable to inferior or meatal opening irrigations. Only when they failed to locate this orifice readily did they resort to puncture below the inferior turbinate.

Futch attributed the advantages of ostium irrigation in suitably selected cases to the diminished danger from embolism, the absence of hemorrhage, the improbable occurrence of emphysema, and the fact that it is a procedure which is feared less by the patient than puncture through the nasal anterior wall and one in which nervous patients would experience little shock. Certain conditions, however, contraindicate the use of this technique. These are a hypertrophied middle turbinate, a deviated septum filling the middle meatus, a high, uncinatoprocess, an overhanging bulla ethmoidalis, an exceptionally deep infundibulum, a natural ostium less than 1.5 mm in diameter, a middle meatus filled with polyps, contracture of the ostia due to previous inflammatory attacks, and closure of the ostia due to irritation by repeated canalizations.

The maxillary sinus has been regarded as a greater contributor to secondary disease than any of the other sinuses. Ebbes examined at autopsy the sinuses of 496 children below the age of fourteen. These children died from a great variety of causes. A purulent infection involving one or more sinuses was revealed in 30.6 per cent of the cases. Most of the infections were in the antrum. In children under two years of age the incidence was higher than in those over two years of age. Von Bajakay analyzed the cases of sinusitis seen in the Budapest Rhinological Clinic during a ten-year period. Of a total of 56,242 patients 13,490 were subjected to various operative procedures. Of those with acute maxillary infection 80 per cent had conservative treatment. In a series of 1,279 antrum punctures only 4 had complications. In general, the operative results compared favorably with those of other large clinics. In a symposium on the final results of operations for chronic suppurative paranasal sinusitis in which the merits and demerits of both the intranasal operation and the external operation were discussed, Hempstead asserts that the surgical treatment of chronic maxillary sinusitis cannot follow rigid and circumscribed rules, for treatment here—as elsewhere—must be suited to the individual patient. Although there are patients



Fig 1



Fig 2



Fig 3

Figs 1, 2 and 3 Showing the profile after injury and after repair, and the final roentgenogram Bone transplantation carried out in three stages

slightly longer than the defect in the jaw so that after shaping it is held locked in place by the spring of the bones. The bone ends are sprung apart with a caliper. Occasionally, drill holes and sutures may be necessary. Great care must be used in handling the transplant, for asepsis and primary healing are more important than any other consideration.

If both horizontal ramus are gone and the chin falls back against the larynx, traction on the chin will separate the fragments so that bilateral transplantation can be done and the transplants held locked by the tension between the chin and the angle of the jaw.

When the loss is at the angle of the ascending ramus of the jaw the transplant must be fractured to correspond to the defect. The transplant thereby loses its rigidity, and support of the jaw with a splint is necessary to maintain fixation.

If the ascending ramus is involved but some of it remains, it is better to fix it firmly against the mandibular notch. The proximal fragment is so small that it is easily freed later. This will give a more satisfactory joint than can be formed by an arthroplasty. This method of simple fixation has proved quite successful.

When the ascending ramus and mandibular notch are shattered and lost there is no reason for removing the condyle. The condyle is adducted and protects the bone transplant so that free opening of the mouth is possible. After all, function is more important than an anatomical preparation.

When the joint cavity is empty a piece of iliac crest with periosteum and fascia left on one end is fixed between the socket and the end of the mandible. If the joint is filled with debris the transplant articulates with the mastoid process. If the defect is long, two operations may be necessary.

If the chin is destroyed it is corrected by a single transplant broken in one or two places to produce a

curve. If the chin and body or ramus are destroyed it may require two or three operations. The chin is built first and one or two transplantations are done for one or both horizontal ramus.

These procedures may seem prolonged but the more the possibility of failure is considered the less one will gamble and a successful result will be obtained.

BRADFORD CANNON, M D

Rodinò, D. A Contribution to the Study and the Treatment of Adamantinomas of the Mandible (Contributo allo studio e alla terapia degli adamantinomi della mandibola). *Riv di chir*, 1940, 6 12

Rodinò recalls the different classifications of epithelial tumors of the mandible and those of the adamantinomas themselves. He discusses the various theories proposed to explain the pathogenetic origin of these tumors and states that the theory of Malassez has found the greatest number of supporters. Malassez claims that adamantinomas originate from paradental epithelial remnants which remain dormant and later, under the influence of some stimulus, give rise to abnormal and atypical proliferation and produce pure malpighian tumors, tumors mixed with adamantine tissue, or pure adamantine tumors, according to the plane of cells from which they originate. Adamantinoma of the mandible is not a clinical rarity. The author describes 2 interesting cases.

The first case occurred in a man, aged seventy-nine years, and the second in a woman, aged thirty-nine years. Adamantinoma is supposed to be more frequent in women and to appear usually between the ages of thirty and fifty years. In both cases, the tumor was localized in the left side of the mandible which is the site of predilection. The prevalence of adamantinoma in the mandible has been attributed to the greater possibility of infection of this bone. The mandibular angle is especially involved by the

neoplastic process this was true in the author's 2 patients. Among the factors capable of inducing the appearance of dental tumors great importance is attached to trauma understood in a broad sense to include dentition dental inclusion surgical intervention dental extraction, and eruption of the third molar.

The course of the tumor is usually very long especially in solid adamantinomas, while the cystic type develops more rapidly. Pain is generally absent except in some cases in the beginning and before the swelling becomes evident. The general condition of the patient remains unaffected if there is no disturbance of mastication. Usually there is no metastasis. In spite of their benignity adamantinomas often recur if not completely removed, and it seems that the recurrence is often malignant. The volume of the tumor varies and may reach the size of a hen's egg or may become even larger. The macroscopic aspect of the tumor depends on its type whether cystic or solid mixed forms are the most frequent ones observed. The tumor slowly destroys the spongy part of the bone and then causes deformation of its internal and external cortex which may be reduced to a thin layer or become eroded. The teeth may be loosened and fall out, fistulas may be formed, and ulcerations may appear which lead to infection and suppuration of the tumor. The structure of adamantinoma is characterized by epithelial formations which form a network in fibillary connection with the bone, but this aspect may be changed by degenerative processes. The cystic cavities are divided by connective tissue which often contains bone lamellae, the latter are remnants of the mandibular bone. Zones of enamel and dentin may be present. The tumor contains numerous vessels with only endothelial walls.

There are few symptoms of this tumor swelling is usually the first sign and the aspect of the tumor depends on its development. The tumor may ulcerate and show granulation tissue which bleeds easily. Suppuration aggravates the local symptoms fistula formation may reduce the size of cystic tumor. Hemorrhage by secondary erosion of an artery is rare. The diagnosis of adamantinoma is difficult, but roentgen and histological examinations reveal the true nature of the tumor. The differential diagnosis includes acute and chronic inflammations of the mandible. The prognosis is good if the tumor is attended to in time, this is aggravated by the presence of complications. The treatment consists of complete surgical excision of the tumor without disturbance of the continuity of the bone. When this is impossible more or less extensive resection of the mandible has been done followed by bone transplantation in young subjects and the use of prosthesis in older individuals.

In the first of the author's cases radium treatment produced healing which has now continued for one year. He recommends this therapeutic method before resort is made to mutilating surgery.

RICHARD KRIEGER, M.D.

EYE

M. Klenney, J. W. L. Corneal Transplantation. *J. Ophth.*, 1914, 37.

Sixteen cases of corneal transplantation are reviewed in detail. The technique of Castroviejo was used in each case. In 6 eyes equal acuity of 6 to 8 or better was obtained, in 3 sight was improved, in 4 it was unimproved and in 3 it was worse as a result of the operative procedure. It was considered that operation was successful in 80 per cent of the favorable and 55 per cent of the unfavorable cases.

It is emphasized that if the graft is to remain clear it must be placed in contact with relatively clear cornea, or lensoma containing corneal elements. Anterior synechiae constitute an unfavorable prognosis indicating a severe process with localizable damage to the intra-ocular structure. Aphakial eyes, likewise, offer a poor outcome because of the presence of vitreous. If glaucoma is present a filtering operation should be performed prior to the transplantation. The presence of cataract requires removal subsequent to the transplantation. In the 6 cases reported the donors were limited to eyes enucleated for ocular neoplasm, no cadaver or feline eyes having been available. In of the donor eyes glaucoma was present the postoperative course in these cases seemed identical with that in the cases with non-glaucomatous transplants.

In 6 cases the iris was found to be widely adherent to the cornea at the time of the keratoplasty and a large piece of the iris was removed with the corneal segment. The remaining adherent portion was freed from the cornea with the spatula, withdrawn, and resected. In no case did the iris become adherent subsequently to the graft. In 1 case mature cataracts were removed through the defect in the cornea, but in neither instance was the graft successful. Transplantation in 2 cases of corneal dystrophy in which the entire cornea participated, was a failure. In another with normal epithelium it proved a success the graft remaining clear.

Edema of the graft occurs immediately after the keratoplasty but if the proportion and nutrition is good the transplant becomes as clear as normal cornea in a few days. Nebulas or fine opacities may remain after healing is complete but these may not be incompatible with a fairly clear graft. Glaucoma intervened as a complication in 6 cases and infection in 1 case of trachoma with hypofunction of the lacrimal gland.

The author believes that in favorable cases the number and degree of successful results will increase.

WILLIAM A. M. M.D.

NOSE AND SINUSES

Escher, E. Median Cleft of the Nose (La fente médiane du nez). *Plast. chir.* 1914, 40.

The author writing from Milan presents cases of median cleft of the nose. He compares the appearance of the nose with that of the ten million



Fig 1



Fig 2



Fig 3

Fig 1 Front view of a rare case of median cleft of the nose with cleavage of the right ala and true median harelip

Fig 2 Side view of same patient shown in Figure 1

Fig 3 The same patient after surgical correction of the lip and nose with a forehead flap

meter embryo. In the former the nostrils are separated by a furrow, the eyes are wide apart, and there is absence of the nasofrontal angle, a double septum may be present also. In the latter there are two olfactory grooves separated by a nasal bud in which there is a vertical fissure. When the fissure fails to close, the cells in either side, which ultimately form the adult septum, develop into two septa instead of one. The conclusion is that there is a primary cessation of development at this stage with failure of normal union of the two halves of the nose.

Median cleft varies because of different degrees of malformation. The most frequent type presents a notching of the tip. The cases presented in this paper, however, had cartilaginous and bony deformities also. The nose was greatly enlarged and flattened, and sometimes formed a groove. The width of the tip was exaggerated and there was separation of the nares. The base of the nose was widened with a pronounced increase in the distance between the eyes and there was an enlargement of the whole upper face. The upper lip may be short or notched and may show scars on its surface. The profile of the severe type was characterized by the absence of the nasofrontal angle, an absent tip, and a short nose, which resulted in a continuous line from forehead to upper lip.

When the cartilages alone are involved, the triangular cartilages fail to join at the correct angle to form a normal bridge and the alar cartilages likewise do not come together in the median line. In the severe cases there may be a bony diastasis and one can feel the anterior border of the frontal process of the maxilla directed sagittally. The nasal bones proper are rudimentary and may lie either in a

sagittal plane or form the floor of the dorsal groove. The cartilaginous septum is thickened if a double septum is not present.

There was 1 case of imperforate nasal passages, but in all the others the passages were patent. The sense of smell was normal. Various types of harelip and other congenital anomalies have been observed in association with median cleft of the nose.

Of the 11 cases reported 5 were in one family. There were 6 children (3 boys and 3 girls), 4 of whom (2 boys and 2 girls) had median cleft. A first cousin of these children had a similar deformity.

The author suggests 3 types of correction depending on the severity of the condition. In the mild cases she shapes the alar cartilages and uses any resected pieces to fill the median depression. In the intermediate cases she readjusts the soft tissues and fractures the bones of the nose to permit moving them to the correct position. Often, however, cartilages or bone grafts are necessary. In the extreme cases it is necessary to utilize a pedicled flap, from the forehead, to supplement the inadequate skin of the nose.

By surgical methods one can obtain good results except in the correction of the wide separation of the eyes.

BRADFORD CANNON, M D

MOUTH

Roux-Berger, J L, and Jadlovky, M. Lymphatic Invasion in Cancer of the Base of the Tongue (L'envahissement lymphatique dans les cancers de la base de la langue). *Presse méd*, Par, 1940, 48 249

In 225 cases of cancer of the base of the tongue under observation at the Curie Foundation, Roux-

Berger and J. J. J. did not find any evidence of retropharyngeal metastases. The glandular involvement was not extensive in cancer of the anterior portion of the tongue but it was more frequently bilateral. This due to the fact that the primary lesion is more frequently bilateral. The bilateral extension of cancer of the base of the tongue occurs because diagnosis is rarely made in a early stage. The only symptom noted by the patient is some difficulty in swallowing which is frequently treated as a sore throat. Diagnosis might be made at this time however by digital examination and without the aid of the pharyngoscope which would show small areas of induration, often unilateral. If treatment was instituted at this early stage, bilateral involvement could be avoided.

In the 5 cases of cancer of the base of the tongue examined, there was clinical evidence of glandular involvement in 97 bilateral lesions of the tongue the glands were involved on both sides in 6 cases on one side in 3 cases, and not involved in 3 cases. In

3 cases in which the tongue lesion was unilateral, the glands were involved on both sides in 4 cases on one side in 7 cases, and not involved in 3 cases. The percentage of bilateral involvement of the glands was therefore, much higher in those cases in which the tongue lesion was also bilateral.

In 67 cases of cancer of the tongue that were treated in the period from 1909 to 1933, there were

16 cures of more than five years duration in 4 cases the lymphatic glands were removed at operation and examined histologically. In 6 of these cases only the submaxillary glands were removed. In 3 of these the glands were examined histologically and found to be carcinomatous in 2. In 3 of these cases it is known that there was glandular recurrence involving the carotid glands bilaterally. In the 35 other cases the satellite glands were completely removed, i.e. the submaxillary, carotid, and supraclavicular glands. In the 4 cases in which the glands were removed surgically there were 14 deaths and 8 recoveries. In 3 cases death was due to local recurrence in 10 to recurrence in the glands, and in 4 to local and glandular recurrence. Glandular recurrences most frequently involved the carotid glands. The glands were involved in 4 of the 8 cases in which a five year cure was obtained. In all these 8 cases the lingual lesion was unilateral, but in the 4 cases in which the glands were involved, the clinical evidence indicated that this involvement was bilateral yet cure was obtained by unilateral operation.

It is evident that bilateral carcinomatous involvement of the glands is not as frequent as the clinical evidence of denopathy indicates. As cancers of the base of the tongue are definitely radiosensitive it may be hoped that radiotherapy will also prove effective against the glandular involvement.

ALICE M. MINTEN

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS, CRANIAL NERVES

Lilja, B Displacement of the Calcified Pineal Body in Roentgen Pictures as an Aid in Diagnosing Intracranial Tumors An Anthropometricostatistical Analysis *Acta radiol*, 1939, Supp 37

This monograph is one of the most detailed and statistically complete modern treatments of the subject of the pineal gland and its position in the normal and diseased brain The object of this work is (a) to determine the range of variation for the normal position of the pineal body, and (b) to demonstrate the position of the pineal body in patients showing verified tumors and to compare these data with the normal material

In a series of 808 normal cases, the pineal gland was observable in the roentgen pictures with a frequency of 37.13 per cent All persons twenty years of age or older were considered together in one group, since the variations in the subgroups after twenty years are not significant All roentgenograms were made with the standard technique of Lysholm The roentgen tube was movable along a semicircular arc which could be turned so that the distance between focus and film always remained 65 cm The distance from the table top to the film surface was always 4 cm

The established values of the radii from the pineal gland were affected by the varying size of the cranium All the radii and diagonals employed for the position of the pineal body were established according to an available large series of skull plates made from the anthropometrical and statistical points of view The variations found by the author in his normal material were compared with those of several other large anthropological series, Swedish as well as those of other nationalities Because of the variations of the size of the skulls, the radii were expressed in percentage relations to the length and height of the crania, all craniometric points being situated on the inside of the cranium The radii, the direction of which corresponds most closely to the length of the cranium (No 1-3 and 7-9), were calculated as percentages of the length (glabella-lambda), and the other radii (No 4-6 and 10-11) were similarly related to the height of the cranium (vertex-opisthion) (See author's Diagram 1 and Table I)

Using the same x ray technique as for the normal series, the pineal shift was studied in 217 patients with verified intracranial tumors Variations in the standard radii were found to occur in 50 per cent of 139 cases of supratentorial tumors and in 14 per cent of 78 cases of infratentorial tumors In the frontal projection the position of the pineal gland was determined in 51 cases Only 53 per cent of 34

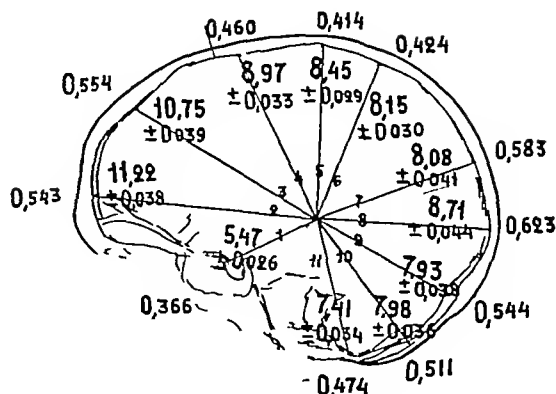


DIAGRAM I

MEANS, IN CM., STANDARD ERRORS AND STANDARD DEVIATIONS OF THE DIFFERENT RADII FROM THE PINEAL BODY

cases of supratentorial tumors showed a lateral displacement of 3 mm or more, and the pineal gland

TABLE I —THE LIMITS OF PROBABILITY ESTABLISHED IN THE NORMAL MATERIAL FOR THE MEASUREMENTS OF THE RADII FROM THE PINEAL BODY, IN PER CENT OF THE LENGTH AND HEIGHT OF THE CRANIUM

Radius No	Outside $M \pm 1\sigma$ Probabil 1.370		Outside $M \pm 2\sigma$ Probabil 1.80		Outside $M \pm 3\sigma$ Probabil 2.22		Outside $M \pm 1\sigma$ Probabil 1.7		Outside $M \pm 2\sigma$ Probabil 2.3	
	smaller than	larger than	smaller than	larger than	smaller than	larger than	smaller than	larger than	smaller than	larger than
1	23.14	34.66	24.10	33.70	25.06	32.74	26.02	31.78	26.98	30.82
2	52.70	66.20	53.83	65.07	54.95	63.95	56.08	62.82	57.20	61.70
3	49.12	64.48	50.40	63.20	51.68	61.92	52.96	60.64	54.24	59.36
4	49.81	64.37	51.02	63.16	52.23	61.95	53.45	60.73	54.66	59.32
5	48.55	59.07	49.43	58.19	50.31	57.31	51.18	56.44	52.06	55.56
6	44.77	58.95	45.95	57.77	47.13	56.59	48.31	55.41	49.50	54.22
7	36.86	48.66	37.84	47.68	38.83	46.69	39.81	45.71	40.79	44.73
8	39.20	52.96	40.35	51.81	41.49	50.67	42.64	49.52	43.79	48.37
9	33.73	48.67	34.97	47.43	36.22	46.18	37.46	44.94	38.71	43.69
10	43.12	58.56	44.41	57.27	45.70	55.98	46.98	54.70	48.27	53.41
11	41.05	53.41	42.08	52.38	43.11	51.35	44.14	50.32	45.17	49.20

The measurements of radii 1-3 and 7-9 are calculated as percentages of the length of the cranium (glabella-lambda), and those of radii 4-6 and 10-11 as percentages of the height of the cranium (vertex-opisthion)

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In the 25 cases of cancer of the base of the tongue examined, there was clinical evidence of glandular involvement in 9; bilateral lesions of the tongue the glands were involved on both sides in 6 cases, on one side in 3 cases, and not involved in 8 cases. In 15 cases in which the tongue lesion was unilateral, the glands were involved on both sides in 4 cases, on one side in 7 cases, and not involved in 3 cases. The percentage of bilateral involvement of the glands was, therefore, much higher in those cases in which the tongue lesion was also bilateral.

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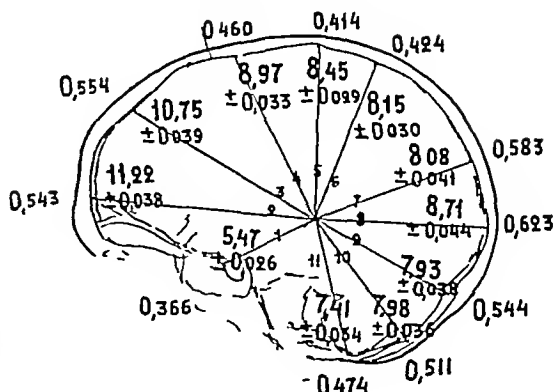


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Radius No	Outside $M \pm 3\sigma$ Probabil 1.370		Outside $M \pm 2\sigma$ Probabil 1.80		Outside $M \pm \sigma$ Probabil 2.22		Outside $M \pm 1.5\sigma$ Probabil 1.7		Outside $M \pm \sigma$ Probabil 1.3	
	smaller than	larger than	smaller than	larger than	smaller than	larger than	smaller than	larger than	smaller than	larger than
1	23.14	34.66	24.10	33.70	25.06	32.74	26.02	31.78	26.98	30.82
2	52.70	66.20	53.83	65.07	54.95	63.95	56.08	62.82	57.20	61.70
3	49.12	64.48	50.40	63.20	51.68	61.92	52.96	60.64	54.24	59.36
4	49.81	64.37	51.02	63.16	52.23	61.95	53.45	60.73	54.66	59.32
5	48.55	59.07	49.43	58.19	50.31	57.31	51.18	56.44	52.06	55.56
6	44.77	58.95	45.95	57.77	47.13	56.59	48.31	55.41	49.50	54.22
7	36.86	48.66	37.84	47.68	38.83	46.60	39.81	45.71	40.79	44.73
8	39.20	52.06	40.35	51.81	41.49	50.67	42.64	49.52	43.79	48.37
9	33.73	48.67	34.97	47.43	36.22	46.18	37.46	44.94	38.71	43.60
10	43.12	58.56	44.41	57.27	45.70	55.98	46.98	54.70	48.27	53.41
11	41.05	53.41	42.08	52.38	43.11	51.35	44.14	50.32	45.17	49.20

The measurements of radii 1-3 and 7-9 are calculated as percentages of the length of the cranium (glabella-lambda), and those of radii 4-6 and 10-11 as percentages of the height of the cranium (vertex-opisthion)

Invariably showed a median position in 27 cases in which the tumor was situated in the posterior fossa.

When the tumors were of supratentorial location, the backward-downward displacement was definitely predominant. No differentiation of the displacement in different directions in the sagittal plane according to the varying positions of the tumors was observable but the position of the tumors proved to be of decisive importance to the lateral displacement. In the cases in which such a lateral shift occurred, it was always to the side opposite the tumor. From the material at his disposal Lilja was unable to tell whether the histological structure of the supratentorial tumors affect the position of the pineal gland.

JOHN MARSH, M.D.

Kabuki, Y. An Experimental Contribution on the Subject of Epidural and Subdural Hematomas and on the Therapeutic Significance of Dehydration and Repeated Cysterna Puncture (Experimentelle Beiträge zur Frage der Epidural- und Subduralhämatome und zu therapeutischen Bedeutung der Dehydratation und wiederholten Zisternepunktion) *Arch. f. Klin. Chir.* 1939, 97, 3.

Epidural and subdural hematomas are produced experimentally in dogs. Their own blood was injected in amounts of 0.5 cm. per kilo of body weight. The technique is described in detail and cure was taken that no return flow occurred. A total of 83 experiments were made: 45 epidural and 43 subdural. In 5 experiments a dehydration treatment instituted for seven days following the operation, and in 3 experiments a continuous decompression was maintained in addition by repeated cysterna puncture (7 times in two or three days). A detailed description of the findings is given in 15 microscopic pictures.

In both types of hematoma organization commences within a few days after the operation from the dura side and is completed within fourteen to twenty days. In subdural hematoma the organization is completed by the dura alone. In epidural hematoma there is also a hyperplasia of the endothelium and of the different cells from the bony side. In all the experiments the fibrous layer was observed at the beginning of the organization which was first considered as of mesothelial origin. Just in clinical observations in subdural hematomas there were numerous capillary spaces lined with endothelium especially in the neighborhood of the dura. Characteristic of them is the fact that they are surrounded by lattice-like fibers and the neighboring tissue is loosely formed. From ten to fourteen days after the operation there are also calcified areas demonstrable much fewer however in the epidural type. Dehydration produced no change in the course of the organizing process. Repeated cysterna puncture seemed to hasten the organization. The organized tissue however remained soft and porous and it seemed to be less than in the other cases. The liquor showed no changes in the epidural cases except a slight increase in the cell

count, in the subdural cases there were hemorrhages and, later, xanthochromic changes with strongly positive albumen reactions. Among the cerebral phenomena (pressure pulse pressure respiration, paresis of the opposite side) subconjunctival bleeding occurs usually on the side of injury; no explanation is given for it. Cause. The frequently observed secondary hemorrhages occur in the loosely woven layer between the dura and the hematomas. They probably originate in the blood spaces and capillaries. This phenomenon is discussed in the literature thoroughly. In regard to the delayed healing in intracranial hemorrhages these secondary hemorrhages may play an important role.

(WASKE) LEO A. JONES, M.D.

Chao, Yi-Cheng, Humphreys, S., and Penfield, W. A New Method of Preventing Adhesions: The Use of Amnioplastin After Craniotomy. *Brit. M. J.* 1940, 517.

Laceration of the brain which is the outcome of gunshot wounds of the head, depressed fractures of the skull, and craniocerebral operations results in meningeocephalic adhesion. The adjacent brain comes to be vascularized through a scar from extracerebral blood vessels. This is most important element in the production of post-traumatic epilepsy.

Stielthal and N. gel concluded that severe injury to the brain resulted in frank epilepsy in 3.9 per cent of the cases, and lesser forms of epilepsy in 35.5 per cent, total of 64.6 per cent. The secret of the high incidence of post-traumatic epilepsy must lie in the scars that result from such injuries. The epilepsy may appear at any time up to ten or fifteen years after the injury. Head injury without penetration of the dura rarely results in epilepsy although the brain damage may be and often is, severe.

The authors experimented on dogs with numerous substances with the hope of discovering one which would allow healing of the meninges without scar formation. They found that amnioplastin, which may easily be prepared from membranes available in any delivery room, allowed such scarless healing of the meninges. Detailed directions for the preparation and use of amnioplastin are given in the article. The authors recommend amnioplastin also for the prevention of adhesions in the peritoneal and joint cavities and about tendons and sutured nerves.

DAVID J. LARSEN, M.D.

Härtel, The Technique of Injection of the Cervical Ganglion (Zur Technik der Injektion des Halses Ganglionoperationen) *Zeitschrift f. Chir.* 1939, 475.

There are 4 methods by which painful sensation may be interrupted the operative by cutting of the sensory root according to the method of Fraser or David, or by the more severe method of Sturges, and the conservative-surgical method of alcohol injection or electrocoagulation. The Kirschner focusing apparatus is superior to the injection is

easily accomplished and possible without any complicated apparatus. Haertel proceeds in the following manner: the skin is anesthetized locally, an incision is made, and a cannula is led to the base of the skull. An injection of from 5 to 10 c cm of $\frac{1}{2}$ per cent novocaine is given. A short chlorethyl anesthesia is now given in order to enter the foramen, and then an injection of novocaine is made into the ganglion. X-ray control of the position of the needle is necessary and then the injection of alcohol into the ganglion may be made without any pain. The author does not recommend general anesthesia for with its use neurological control is lost. The injection of scopolamin eukodal-ephetonin acts irregularly and is therefore not employed. Evipan and resuscitation with coramine before the alcohol injection is made is ideal but complicated and is used only for special cases.

The stereoscopic control of the needle with x-rays is advised. The pictures are taken with the patient lying on his abdomen and the central ray is directed nearly in the axis of the cannula.

Electrocoagulation is somewhat more complete but is limited to circumscribed foci, whereas the alcohol distributes itself more evenly. A complete destruction of the tissue is not necessary as only the pain fibers and those controlling the temperature sense should be interrupted. Alcohol, in contrast to coagulation, does not affect the tactile sense.

The danger of keratitis and recurrence of the attacks depends upon the depth and extent of the anesthesia. The trophic disturbance of the cornea incident to total anesthesia will adjust itself in time so that the protective glasses may be removed later. The keratitis does not occur if the eye is gradually accustomed to the anesthesia and prepared beforehand by a partial or incomplete anesthesia. If a total destruction is necessary later on account of a recurrence there is no harm done. It is better, however, to proceed gradually and let recurrences take place, and eventually the disease will be overcome.

In the discussion SCHOENE praised the alcohol injection which has been successful in all of his cases. He does not use a focusing apparatus and the foramen is but rarely x-rayed. In the aged the ganglion may become so thin that it is very easy to go beyond it. Anesthesia of the skin and the soft parts is produced with $\frac{1}{2}$ per cent novocaine, and of the base of the skull with a 2 per cent solution. In a few cases Schoene uses a chlorethyl narcosis for a few moments when puncture of the ganglion is done. He injects a 2 per cent anesthetic solution into the ganglion. He recommends a syringe with a screw-thread end so as to be able to inject slowly and visualize the amount injected. With the appearance of muscular weakness the injection is stopped immediately.

All of the pareses disappeared again. Freedom from pain was obtained in all but an occasional case, not seldom, however, one must secure total anesthesia of the respective side of the face to effect a cure. Tactile sensation is somewhat impaired in most cases. The injection cannot be given so perfectly in

all cases that trophic disturbances of the cornea do not occur. With increased experience the amount of alcohol injected is small. Schoene used from 0.3 to 0.8 c cm.

The intracranial severing of the sensory root does not only sever the fibers of pain sense but also those of the tactile sense. However, an ideally executed severance may save the fibers to the eye. The same result may be obtained also with an alcohol injection but not with certainty. This procedure also should be done by an experienced operator.

SAUERBRUCH states that the literature reports but few of the late sequelae. In his clinic the Kirschner method is employed.

ADLER reported that in 1 of his cases a severe keratitis led to blindness. Also, after electrocoagulation he saw a stroke like paralysis of the left side, but it gradually receded.

HAERTEL in closing said that conduction anesthesia of the ganglion is necessary only occasionally. In resections of the ulcerating upper jaw it should not be employed because of the danger of meningitis. Abducens paralysis has not been seen during the last few years, formerly it was more frequent. Haertel does not employ electrocoagulation on account of the greater danger, however, he states that the alcohol injection in inexperienced hands may do considerable damage. (Peiper called attention to this before.) After the first few injections the author has not seen any bad results during the past twenty-six years. The technique cannot be described, it must be seen and then practiced.

(SCHAEFER) LEO A. JUINKE, M.D.

SPINAL CORD AND ITS COVERINGS

MacFee, W. F. Cervical Rib Causing Partial Occlusion and Aneurysm of the Subclavian Artery. *Ann. Surg.*, 1940, 111: 549.

In a study of 360 cases of cervical rib with pressure symptoms 235 presented nerve symptoms alone, 106 nerve and vascular symptoms, and 19 only vascular symptoms. Among the 125 cases with vascular symptoms there were 27 in which a fusiform, aneurysmal, or cylindrical dilatation was observed. Six cases presented gangrene of the fingers.

Knowledge regarding the manner of production of the vascular changes is still lacking. Of the three main factors, pressure by the anomalous rib, pressure by the anterior scalene muscle, and paralysis of the sympathetic fibers passing to the vessel, the last seems the most important, in view of the observation that vascular changes may be present when the cervical rib impinges only on the brachial plexus, and the persistent anatomical endarteritis distal to the constriction which is occasionally found, as in the author's case.

The case reported is that of a twenty-eight-year-old white male. The tips of his left thumb, index and middle fingers showed dry, blackened, gangrenous areas. In the left supraclavicular region there was a hard, raised structure above which a pulsating

vein could be felt. The left arm bowed slightly general trophy and the left hand was cyanotic. The brachial artery below the middle and distal thirds of the humerus felt like hard, pulseless cord. There were no pulsations in the left forearm, wrist or hand. There were no focal areas of sensory or motor disturbances to indicate involvement of the brachial plexus. A roentgenogram of the spine showed an incompletely developed cervical rib on the left side.

At operation the anterior end of the cervical rib formed a mass of rounded, dense cartilage. The subclavian artery lay in the narrow space between the scalenus anticus tendon and the end of the rib and was tightly compressed. Immediately distal to the point of compression, the artery presented a fusiform aneurysmal dilatation. The brachial plexus lying posterior and lateral to the artery passed over the cervical rib and suffered no interference. The tendon of the scalenus was severed near its attachment. The cartilaginous mass at the tip of the rib was removed. Relief of the pain was immediate, but the fingers did not heal completely for about six months. The pulsations in the wrist did not return.

About nine months after the operation the patient began to feel pain in the left shoulder which later radiated along the medial surface of the arm, forearm and hand. It was apparent that the brachial plexus was involved and a second operation was performed. It was found that the portion of the rib removed at the first operation had partially regenerated and there was new bone and scar formation sufficient to compress the plexus against the clavicle. The aneurysmal dilatation of the subclavian artery observed at the first operation had almost disappeared and the vessel at this point was approximately of normal caliber. The painful symptoms subsided after ablation of the rib. The author believes that the cervical rib should have been completely removed or not disturbed at all, at the first operation.

D. W. J. IMPASTARO, M.D.

Smith, B. C. Thrombosis of the Third Portion of the Subclavian Artery Associated with Scalenus Anticus Syndrome (see Surg 940 547)

Thrombosis of part of the subclavian artery is relatively rare; this case concerns thrombosis of the third part of the left brachial artery which simulated coronary disease. In spite of confusing anatomical terminology the author's idea of the cause of the condition is brought out. The patient presented himself with pain in the left chest and down the left arm, associated with dyspnea on slight exertion; he could not use his left arm as a crutch for more than four hours at stretch. On examination, the blood pressure readings were less in the left arm, there were oscillometric readings. There was trophy of the thenar eminence and the whole hand and forearm were cyanotic.

At operation, the scalenus anticus muscle was divided, which exposed the subclavian artery; the branches of the second part were seen. The third part of the artery did not pulsate because of band

of fascia posterior to the scalenus muscle had constricted it. A needle was inserted distal to the constriction, but blood could not be obtained. The prearterial fascial band was released but pulsation did not appear in the third part of the artery. The postoperative course was uneventful. Ten months later the patient was symptom free and there was only a slight decrease in the oscillometric reading of the left arm.

AMER. VER. REC'D. M.D.

Patterson, R. H. Cervical Ribs and the Scalenus-Muscle Syndrome (see Surg 940 55)

A brief résumé of the comparative anatomy of cervical ribs leads inevitably to the discussion of their occurrence in the human being. It is interesting to note that human ribs are much more common than cervical ribs. The syndrome of the scalenus-anterior muscle is described, with mention of the fact that the same syndrome may be produced, in the absence of extra ribs, by the hypertrophied scalenus-anterior muscle.

The paper is based on the study of 31 cases of the scalenus syndrome. Excellent diagrams of the variations in the extra ribs are presented. Sixteen of the 31 patients had symptoms due to irritation or pressure on the brachial plexus or subclavian artery. Although the lower part of the plexus was most commonly affected, in one case or another all of the components of the plexus were involved. Pain was the most common complaint. Of the 6 patients, 5 had extra ribs and 6 had enlarged transverse processes and hypertrophied scalenus-anterior muscles. All of the patients with extra ribs were between twenty-one and thirty years of age; 7 of them were operated on. In the group with the scalenus syndrome alone the patients were between twenty and thirty years of age and 3 of the 6 were operated on.

In this article it is recommended that the scalenus-anterior and the scalenus-medius muscles be divided, along with removal of part of the cervical rib if the artery is not freed by division of the muscles. To avoid the plexus, the author suggests that the muscles be divided just above their insertions. The fibrous band may be found and divided in mass, arising from the tip of the extra rib and joining the scalenus-anterior muscle.

The differential diagnosis is carefully worked out, especially from common conditions which at first could be mistaken for this syndrome. The scalenus-anterior syndrome is much more common in the absence of extra ribs than with them. The article is most instructive although the surgical procedures recommended are somewhat more radical than those usually carried out by other surgeons.

AMER. VER. REC'D. M.D.

Verl, A. and Patti, V. Operative Intervention in 2 Cases of Vertebral Angioma (Intern. et. in d. e. con di angiom. cerebrale) Riforma med 247, 303

Including the cases presented by the authors, only 6 cases of cerebral angioma have been oper-

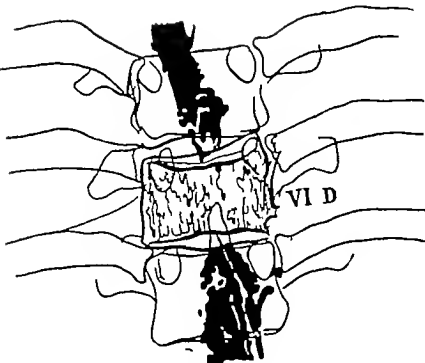


Fig 1

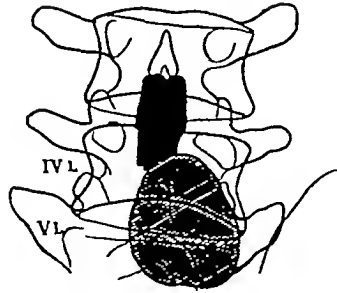


Fig 2

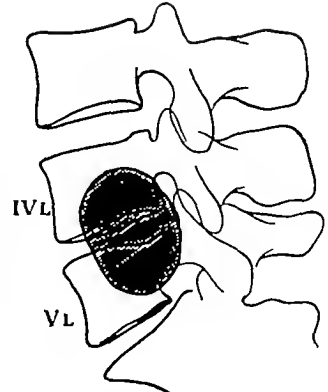


Fig 3

Fig 1 The shadow of the lipiodol, ascending and descending, limits the zone of compression. The body of the sixth dorsal vertebra shows the reticulated appearance of the angioma.

Figs 2 and 3 The shadow of the lipiodol stops on the superior pole of the mass which occupies part of the bodies of the fourth and fifth lumbar vertebrae.

ated upon. The operative mortality is reported as 60 per cent.

The first case was that of a forty-seven-year-old woman who at the time of operation presented signs of a level lesion at the sixth dorsal segment, with subarachnoid block, arrest of lipiodol at the sixth dorsal vertebra, and the typical striated appearance of angioma of the sixth dorsal vertebra (Fig 1). At operation the spinal compression was being caused by a mass arising from the posterior surface of the body of the sixth dorsal vertebra. While attempts were being made to remove some of this tissue a severe hemorrhage occurred from which the patient died.

The second case was that of a forty-one-year-old male who presented signs and symptoms of compression of the sacral segments. X-rays showed a smooth ball-like mass involving the fourth and fifth lumbar vertebrae (Figs 2 and 3). During the operation it was noted that the arches of the fourth and fifth vertebrae were very friable. The meningeal tube was reduced in size and pushed to the right, it occupied about one-third of the canal. The other two thirds were occupied by a yielding mass. When attempts were made to remove this mass a severe hemorrhage occurred. This was controlled by gauze packing. This patient made a good recovery.

DAVID IMPASTATO, M D

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Di Paola, N. The Use of Tannin and Formalin to Delay Osseous Regeneration after Subperiosteal Resection (Sull'impiego del tannino e della formalina per ritardare la rigenerazione ossea dopo resezione sottoperiosteale) *Clin chir* 940 6 9

Di Paola recalls his previous paper on the prevention of osseous regeneration in which it was concluded that both the thermocautery and silver nitrate were not only ineffective, but even dangerous agents for the prevention of osseous regeneration, and that solution of formalin (1 to 20 per cent) was best adapted to that purpose.

In the current paper the author reports on a series of rabbits in which subperiosteal resections were done. Certain animals being treated with a 10 per cent solution of formalin, and certain others with 20 per cent hydroalcoholic solution of tannin. In

third group the superior portion of the periosteum treated with tannin, and the inferior portion with formalin, in order that differences should be more clearly marked. The animals were observed for period varying from 1 to six months after which they were killed and the tissues examined both histologically and roentgenologically. Of the 3 rabbits treated with tannin, died after two days of fibrinous pleuritis due evidently to the penetration of the material, and in all cases notable retraction of the surrounding tissues was found, involving even the pleura. Regeneration on the other hand, as present after fifty days. The animals treated with formalin showed no trace of regeneration after more than three months, and damage to the surrounding tissues was found to be negligible. It was concluded therefore that formalin as the optimum substance for the preparation of the resected ribs.

EORTH FARMINGTON, MD

Taylor H. C., J., and Waltman C. A. Hyperplasia of the Mammary Gland in the Human Being and in the Mouse. Morphological and Etiological Contrasts. *Arch Surg* 940, 40 733

The authors discuss the histology of the two major forms of chronic cystic mastitis, namely adenofibrosis and hyperplasia of the ducts. They reiterate that in order that a claim can be made that chronic cystic mastitis has been reproduced experimentally in animals, at least a fair proportion of the morphological forms of the human disease must be demonstrable. These are summarized as follows:

Adenofibrosis

- Fibrosis of the lobule
- Diffuse proliferation of normally constructed acini with connective tissue

Abnormal duct proliferation

- Multiplication of cell layers lining the canal
- Multiplication of small acini in lobular arrangement

- Loss of lobulation by diffusion of acini
 - Appearance of solid tubules and coalescing cell masses
- Non neoplastic disease of the duct
 - Dilatation of the duct with secretion in the lumen
 - Inflammation of periductal tissues
 - Abnormal function or degeneration of epithelium
 - Abnormal proliferation of duct cell
 - Sweat-gland epithelium
 - Neoplastic proliferation of the ducts
 - Groups of cystic ducts
 - Reduplication of the cells lining the ducts
 - Formation of arcades
 - Occlusion of ducts by cells
 - Papillomas

Evidence is then presented that there are at least two and possibly more separate entities which have been called chronic cystic mastitis. The first type is characterized clinically by a diffuse nodularity more marked in the outer quadrant, and by premenstrual pain. On gross section an increase in fibrous tissue is often evident. The basic histological lesion is fibrosis or adenofibrosis involving the interstitial fat as well as the periductal tissue. The ducts are relatively little affected. Dilatation of the glands and various evidences of epithelial hyperplasia are important and frequent complications, but do not characterize the disease. The condition is analogous to adenomyosis of the uterus and should be termed adenofibrosis.

A second definite type of mammary disease is characterized by discharge from the nipple, often associated with palpable dilatation of the ducts near the areola. The basic histological observations are edema of the lobules with perhaps some evidence of secretion in the cells, dilatation of the ducts, periductal inflammation and possibly some hyperplasia of the lining of the ducts. Depending on the conditions present the disease should be termed non-puerperal lactation, periductal inflammation, or duct hyperplasia.

A third type is perhaps to be recognized in lesions among more or less locally such as single papilloma in the larger ducts or the isolated nodules of "Schönlein-Miesch" disease.

The exact character of the individual lesions of chronic cystic mastitis and the association of certain of these to form separate entities must be recognized before any comparison can be made with the lesions usually produced by the administration of endocrine substances to the lower animals.

The authors next consider the subject of endocrine dysfunction in women with chronic cystic mastitis. While patients with chronic mastitis have disturbances of the menses in only a minority of the

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Di Paola, N.: The Use of Tannin and Formalin in Delay Osseous Regeneration after Subperitoneal Resection (sull'impiego del tannino e della formalina per ritardare la rigenerazione costale dopo resezione sottoperitoneale). *Chir. Riv.* 1924, 6, 9.

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LEON FALKENBERG, M.D.

Taylor, H. C., Jr., and Waltman, C. A.: Hyperplasias of the Mammary Gland to the Human Being and in the Mouse. Morphological and Etiological Contrasts. *Arch. Surg.* 1924, 40, 733.

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- Multiplication of small acini in lobular arrangement

- Low lobulation
- Diffusion of acini
- Appearance of solid tubules and coalescing cell masses
- Non neoplastic disease of the duct
 - Dilatation of the ducts with secretion in the lumen
 - Inflammation of periductal tissues
 - Abnormal function or degeneration of epithelium
- Abnormal proliferation of duct cells
 - Secretory gland epithelium
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The exact character of the individual lesions of chronic cystic mastitis and the association of certain of these forms separate entities must be recognized before comparison can be made with the lesions artificially produced by the administration of endocrine substances to the laboratory animal.

The authors next consider the subject of endocrine dysfunction in women with chronic cystic mastitis. While patient with chronic mastitis has disturbances of the menses in only a minority of the

was given estrogenic substance by mouth over a period of three months.

The authors are not able to state definitely that the estradiol benzoate (progyron B) was contributing cause to the patient's carcinoma, but they think it entirely possible indeed even probable that it was. The problem can be definitely settled only by careful and long continued follow-up of large numbers of women treated with estrogen.

At present the authors are sufficiently alarmed by their own experiences to warn against the needless and excessive administration of estrogenic substances so prevalent today. Until more is known about the effects of these but now they believe that their use should be avoided (1) in large or prolonged doses, (2) when there is a family history of breast cancer (3) without initial and repeated clinical examination of both breasts, and (4) in patients with chronic mastitis, carcinoma or any form of breast neoplasm, before or after surgical or radiation treatment.

JOSEPH K. NAR, M.D.

Brooks, B., and Daniel, R. A., Jr.: The Present Status of the "Radical Operation" for Carcinoma of the Breast. *Ann Surg* 94, 655.

The radical operation for carcinoma of the breast is founded on principle which makes it obligatory to assume that even small difference in the technique would frequently produce a fatal difference in the result obtained. The authors call attention to the fact that the value of operative treatment of the breast is being questioned without sufficient analysis of the varying techniques employed. They also report the results in a series of cases each having the same operation, one that they believe conforms to the basic principles of the radical operation derived by Halsted. The purpose of the operation is the extirpation of single block of tissue so large as to include the breast, pectoral muscles, axillary contents, and also all of the intervening and as much possible of the surrounding tissues. The surgical technique is described.

The authors are of the opinion that the extent of the disease as determined at operation or from subsequent study of the gross specimen is far more important in the prognosis than any classification of tumors according to the grades of malignancy. Their patients are divided into three groups. Group 1 contains the cases in which there was no demonstrable cancer outside of the mammary gland. Operation was followed by subsequent gross and microscopic examination of the tissues removed. Group 2 contains the cases in which no cancer was observed during the course of the operation but later cancer was demonstrated in the inferior axillary lymph nodes by microscopic study. Group 3 was composed of the cases in which cancerous nodes were observed in the axilla or near the chest wall at the time of operation.

The results in 7 cases operated upon by the Halsted technique and classified into the three groups are reported. All patients have been operated on for more than five years.

There were 13 cases in Group 1 with 1 death from recurrence which gives a five or more years cure of 92.3 per cent. In Group 2 there were 29 cases with 17 deaths from recurrence or a five or more years cure of 34.5 per cent. There were 31 cases in Group 3 with 5 deaths from recurrence and 1 patient living with recurrence, or a five or more years cure of 13.9 per cent but 16 per cent of this group of patients are living five or more years. *EUG. O. LAMER, M.D.*

TRACHEA, LUNGS, AND PLEURA

Enquist, B.: Mediastinal Pneumothorax. Mediastinal Hernia of the Lung (El neumothorax mediastinal hernia mediastinal del pulmón). *A. de la Cátedra de patol. y clí. de la tuberculosis* 93, 5. P. 7.

Enquist states that during the past few years the occurrence of real mediastinal hernia of the lung, without relation to pneumothorax, has been reported. He distinguished (1) mediastinal pneumothorax due to traction, which is more frequent than is usually thought and is of diagnostic importance from the surgical point of view because of the possibility of contralateral pneumothorax or pyothorax in the course of plastic intervention or of a pneumonectomy and (2) mediastinal pneumothorax due to anatomic pulmonary distortion or impulse which is less frequent and offers particular interest because of its etiopathogenesis and its morbidological affiliation with the classical spontaneous thoracic and cervical pneumothoraces.

There are three weak points in the mediastinal wall through which hernia may occur: the antero-superior (the most important from the point of view of frequency and is located in the upper part of the anterior mediastinum above the upper tero-pericardial ligament, the postero-inferior is located in the lower part of the posterior mediastinum, between the descending aorta and the esophagus (it is vulnerable only from the right to the left) and the third is found in the posterior mediastinum between the esophagus and the third, fourth, and fifth dorsal vertebrae.

Mediastinal pneumothorax due to traction should be suspected in any thoracic disorder which involves the mediastinum. It occurs especially in adult of both sexes and may be caused by any sclerosing or telescatic process as pulmonary tuberculosis, bronchiectasis, cancer of the lung, and some congenital processes (fetal defects, aplasia of the lung). Tuberculosis is the most frequent cause usually in its bronchial form of the disease with frank unilateral predominance and a marked tendency to fibrosis. The predisposing factors are the presence of the three vulnerable points in the mediastinum, the disposition of the costo-mediastinal pleural sinuses, the level of the anteroposterior weak point, the relation of the costal pleura with the thoracic wall at this point, and the degree of resistance of the hemithoracic wall to the pulmonary retraction. The determining factor

is the rupture of the equilibrium between the elastic tensions of the two lungs the lack of proportion between the sclerosed or atelectatic lung and the capacity of its hemithorax causes aspiration or traction of the other lung through one of the vulnerable points

The pneumonocoele never causes functional disturbances of the mediastinal compression type and its presence can be suspected only by careful examination there is a zone of highly located sonority at the side of the sternum, more pronounced during inspiration, at times, the heart sounds are heard suddenly further away at the base Usually, pneumonocoele is a roentgen finding, indicated by a vague clearing in the mediastinal space, easily confused with that of the displaced trachea As a rule, it is necessary to use the technique of penetrating roentgenography (overexposed films taken with an antidifusor) or of tomography to demonstrate the pneumonocoele, which then appears as an abnormal clearing in the mediastinum Differential diagnosis must be made from displacement of the mediastinum accompanied by non hernial invasion of the opposite hemithorax by the healthy lung, deviations and angulations of the trachea, arched fibrous bands, and the course of the azygos vein which may imitate the contour of a pneumonocoele

Mediastinal pneumonocoele due to autonomic pulmonary distention may occur in the course of some congenital or acquired pulmonary disorders, such as aerial cysts, polycystic dysgenesis, ampullar emphysema, bronchial obstruction by a foreign body, and some acute infantile diseases of the lung It occurs especially in children and nurslings, and nearly always through the anterosuperior weak point The determining pathological process is located in the herniated lung itself, which usually presents profound anatomical changes that are nearly always congenital The other lung may be normal or show similar but more discrete changes The appearance and development of the pneumonocoele is favored by any factor that tends to increase the intrapulmonary pressure In most cases, the pathogenesis of the distention is essentially bronchial The pneumonocoele may disappear when its determining causes cease to act, provided that the elasticity of the lung is sufficiently preserved

The predisposing factors are the same as in the other varieties of mediastinal hernia The chronic emphysematous or cystic form is usually asymptomatic and constitutes a roentgen finding The acute form is characterized by suffocation, cyanosis, tympanism of the sternal and neighboring areas, displacement of the impulse of the apex of the heart, and venous distention in the neck The evolution varies with the determining cause Roentgen examination is indispensable for the diagnosis and lateral exposure is at times very useful The differential diagnosis includes the determination of the presence of a mediastinal hernia and of its anatomicopathological variety the latter is very difficult and requires differentiation between a giant cyst and

spontaneous pneumothorax, which may even be impossible with exploratory thoracotomy and pleuroscopy

As the disorder presents great analogies with extrathoracic spontaneous pulmonary hernias from the etiopathogenetic point of view, the classic chapter of hernias of the lung should be revised and amplified

RICHARD KEMFEL, M D

Bracco, A N Continuous Aspiration for the Treatment of Pleuropulmonary Perforations and Caverns (Aspiración continua para el tratamiento de las perforaciones pleuropulmonares y de las cavernas) *Rev Asoc med argen*, 1940, 54 65

Bracco states that aspiration has two main applications in the treatment of pulmonary tuberculosis and of its complications one is derived from the experiments of Monaldi (1938) in treating various types of cavern (intracavity aspiration), and the other fulfils the therapeutic requirements of emergency symptoms and provides the subsequent treatment for pulmonary perforations into the pleura which cause simple spontaneous pneumothorax or complicate artificial pneumothorax In these two applications, the aspiration may be performed continuously or at intervals, but continuous aspiration is the most important and deserves special consideration because numerous opportunities for its use arise in daily practice

The aspiration treatment of pulmonary perforations includes that of the acute, the subacute, and the chronic stages In the acute stage, the treatment is directed toward the relief of the dyspnea Interrupted extraction of air by means of the pneumothorax apparatus is indicated only in the treatment of small perforations in healthy tissue The serious perforations require permanent drainage for which the use of needles and trocars is contraindicated, because they are incapable of establishing ample drainage, besides, they traumatize the tissue of the lung during its expansion, and the thoracic wall On the other hand, it is difficult to keep them in a fixed position and they may get out of the pleural cavity and thereby cause symptoms of asphyxia which will require urgent measures The sound of Nélaton only should be employed, it offers the advantage of allowing perfect drainage, it does not traumatize the tissues, and it permits the use of lavage as soon as empyema sets in

Siphon drainage, according to Buelow, is sufficient in slight cases, but continuous aspiration is needed in general, and all the more in grave cases, in order to insure good results The watertap may be used to create the necessary vacuum, and the valve of Jeanneret and Jolyet to regulate the vacuum, which should range from about -15 to -40 cm of water The aspiration drains the air and the pleural secretions This is the only procedure which will allow the obtention of pulmonary expansion in grave cases of perforation which endanger the life of the patient In the subacute and chronic stages, aspiration by itself may be a sufficiently efficacious method to obtain

the apposition and adhesion of the two pleura. If this does not occur thoracoplasty must be used in conjunction with spiration. High degrees of vacuum should not be employed in these stages.

In the treatment of caverns, the method of Monaldi is giving very encouraging results. It allows occlusion of the caverns by re-expansion of the telestatic pulmonary tissue consequently the treatment of pericavernous telestatics is contra-indicated because it is injurious. It also eliminates the factor of insufflation and the traumatism of cough and it establishes drainage of the cavernous secretions. For this reason, its most typical indication is given by insufflated caverns with pericavernous atelectasis and wide open or only partially obstructed bronchi, and by caverns with insufficient drainage of their secretions. The association of thoracoplasty and cavernous drainage allows the solution of important problems. The indications and the end-results of the method cannot yet be stated with exactness.

RICARDO KINRY, M.D.

VACCAREZZA, O. A. and VACCAREZZA, R. D.: Partial Resection of the Scapula in High Thoracoplasties (Resección parcial de la escápula en las toracoplastías altas). *An. de la clínica de pediat. y clin. de la laborator.* 1939, No. 2, p. 57.

The Vaccarezas recommend partial resection of the scapula as complement to partial upper thoracoplasty involving five or six ribs. It presents the following advantages: greater selectivity in collapse, greater economy in costal resection and in compression of the healthy areas and elimination of static, esthetic, and functional disturbances of the shoulder. The resection should extend from the lower angle of the scapula upward as far as necessary to exceed the first non-resected rib. Generally the horizontal section reaches 4 to 6 cm. from the lower angle. The authors see this partial resection of the scapula as complement to the partial thoracoplasty of Semb or of Graf-Schmidt. The resection of the scapula should be performed before that of the ribs because it provides a better field for the latter.

Local anesthesia is sufficient and it is advisable to infiltrate also the insertions of the round muscle. Subperiosteal resection is preferable, provided that the periosteum is treated so as to avoid the subsequent formation of adhesions or osteophytes. Accents the bone is gained on the spinal border and in front of the insertion of the rhomboid muscle the periosteum is elevated for a few centimeters on the superficial aspect of the bone, the insertion of the rhomboid is detached, and the deep aspect of the bone is denuded far enough to allow the application of a forceps to exert inward traction. Elevation of the periosteum is then continued on both aspects as far as necessary to resect the bone at the angles of which are then rounded off. The detached surface of the periosteum is electrocoagulated and the muscular flaps are sutured. This is followed by resection of the ribs.

The authors have used this method in cases in 4 Semb and 16 Graf-Schmidt operations. Excellent esthetic and functional results were obtained in all the patients.

R. Vaccarezza, M.D.

Wood W. B., Sellers, H., Roberts, J. E. H., Edwards, T., and Others: Discussion on Cystic Disease of the Lung. *Proc. R. Soc. Med. Lond.* 1942, 35, 335.

According to Wood cystic disease in the lung consists of hydatid cysts and closed fluid cysts, both of which are rare. Dermoid cysts are in the mediastinum and not strictly lung cysts. Congenital cysts are not cysts in the pathological sense of the word; they are sacular formations which are not closed and which contain air.

Cystic disease in the living is difficult to recognize and to demonstrate, except by roentgenography and the introduction of opaque oil for lung delineation.

In the London Chest Hospital, 500 patients were admitted, and among these 20 were diagnosed as having cystic disease of the lung. In another group of 80 patients with disease of the lung, 3 were found to have cystic disease.

The most common form of cystic disease of the lung is cystic bronchiectasis, which is strikingly different from sacular bronchiectasis. Balloon cysts are single and replace a large part of the lung. They are usually discovered in infants or young children. They have thin walls and a tendency toward increasing inflation by check valve action and they may lead to attacks of dyspnea.

Solitary cysts are smaller in size and are usually discovered by accident. They do not cause symptoms unless infection comes into contact with them. Multiple cysts often replace a large part of the lung by a aggregation of medium sized cavities. There may be no symptoms unless infection supervenes but such lung is constant danger of secondary infection.

Berry cysts are clusters of smaller cysts arranged in grape-like bunches. They often occur in the upper lobe where drainage is good. Fluid filled cysts may discharge their contents after rupturing into bronchi and they may cause spontaneous pneumothorax.

Cystic conditions in the lungs have been found at all ages and even before birth. The cysts appear to result from failure of the extremely complicated system of lung budding which should proceed until the final alveoli are formed. The budding stops prematurely and the termination of the already formed bronchi apparently elicits outgrowth which occupies the spaces where pulmonary parenchyma should have developed, and dilated bronchi take the place of the lung alveoli.

In the treatment of cystic disease of the lungs the risk of leaving a cystic lung alone must be compared

with the risk of attempting its removal in every instance. The authors suggest that balloon cysts in infancy and early childhood should be removed if they are causing symptoms.

As to the treatment of the berry

cluster type should not be disturbed. Cysts of the bubble type should be removed by lobectomy or pneumonectomy if the condition is discovered in childhood and before secondary infection has produced a pus sodden lung. When suppuration has occurred operation is too late. Before operation, exploration of the whole bronchial tree with lipiodol must be done.

Sellors states that cystic disease has two striking features, the regularity and constancy of the lining epithelium, and the erratic distribution and amount of supporting tissue. Fibrous tissue is the most common feature, but in some instances blood vessels, muscle, and mucous glands predominate to such an extent that a tumor formation has been suggested.

Mistaken diagnosis is very common in cystic disease. In cases of doubt the cavity should be opened and explored, and a piece of the wall removed for section.

Pneumothorax is likely to be confused with the large balloon type of cyst, and here the tomograph is of value in showing the continuous outline of the cyst against the chest wall. It may be difficult to distinguish tuberculous cavities from cysts, and emphysematous bullæ are similarly confusing, but prolonged observation will show some alteration in the size of the bullæ, but not in the cysts.

Multiple cysts or "honeycomb" cysts differ from bronchiectasis only as far as academic importance is concerned, but the treatment is the same.

Roberts believes that cystic disease and bronchiectasis could co-exist. Whatever might be said of operation in adults, removal of the offending lung or lobe should be done in children before infection occurs.

Edwards says that the most common complication in all varieties is secondary infection. Another complication is spontaneous pneumothorax. If and when a diagnosis is made in the unilocular and, particularly, giant cysts, the operation should be done as soon as the diagnosis has been made.

Thick-walled unilocular cysts when containing pus should be drained for several weeks before carrying out lobectomy.

According to Scadding the diagnosis of cystic disease of the lung in adults can be made with confidence only in a very small number. Cases in which infection has complicated the disease may have the identical symptoms of bronchiectasis, and the diagnosis will then be left in doubt.

Ellman believes that there is an association of congenital cystic disease of the lungs with cystic disease in other organs. This is true especially of large lobulated hydronephrotic kidneys with calcification in the cysts.

J. DANIEL WILLEMS, M.D.

Huizinga, E. *The Origin of Bronchiectasis* (Ueber die Entstehung der Bronchiektasie). *Acta radiol.*, 1940, 21, 75.

Huizinga endeavors to establish the causes of bronchiectasis chiefly by using a series of bronchograms from the same patient and by studying

bronchograms taken during inspiration and expiration. He states that a single bronchogram may be misleading and illustrates this fact by reporting a case of a boy in which clinically and bronchographically the diagnosis of extended pulmonary abscesses had been definitely established and follow-up bronchograms taken after two year intervals showed gradual diminution in the size of the cavities, and finally gave a picture of a typical bronchiectasis, which might have been considered congenital bronchiectasis. The author believes that bronchiectasis usually is an acquired condition.

His study is based on bronchographic examination of 100 children. The bronchiectasis developed after the entrance of a foreign body into the bronchial tree in 20 children, after pneumonia in 39, after pneumonia but with onset of the complaints before outbreak of the pneumonia in 8, and with a more indefinite history in 33.

The author agrees with Brauer's theory that the mechanical causes of bronchiectasis consist of loss of elasticity of the bronchi on the one hand, and in the traction forces influencing the bronchi from the outside on the other hand.

Bronchographic studies on normal individuals showed that the width of the peripheral bronchi varies greatly during the respiratory cycle, relatively much more than would be expected from the change in the lung volume. On the basis of these studies pleural adhesions cannot be held responsible as the cause of bronchiectasis in bronchi of reduced elasticity. Even in moderate expiration and inspiration, the differences are marked, especially in bronchi of diminished elasticity.

The author discusses the possibility that the loss of bronchial elasticity sometimes is only a result of the loss of muscle tonus. This theory, he believes, was borne out by the findings in the case of a girl of ten years who had marked bronchiectasis sixteen days after removal of a foreign body from the left main bronchus, while four months later the bronchogram was normal. On the other hand, bronchiectasis from shrinkage of connective tissue, as occurs after pneumonia, does not heal but rather develops more extensively in time, as the author demonstrates in the case of a girl, aged two, who developed bronchiectasis and displacement of the mediastinum after pneumonia. Roentgenograms taken when she was seven years old show an increase of both the bronchiectasis and the mediastinal displacement.

Atelectasis can lead to bronchiectasis just as shrinkage of the connective tissue does, but changes due to atelectasis are reversible. The author illustrates this with the report of a case of a boy of one and one half years who had inhaled a peanut four months before admission. It was removed bronchoscopically from the left main bronchus, and extended bronchiectasis with mediastinal displacement was found, but eleven months later normal bronchograms were obtained. In this case the air behind the obstacle had been resorbed and atelectatic collapse (Coryllos and Birnbaum) had developed. The other

possibility replacement of the air by transudation or after the transudate becomes infected, by exudation, does not lead to quick shrinkage of the involved lobe.

Affect the collapse often lead to complete shrinkage of the lower lobes (Chauffard triangle) and produces condition which formerly often had been mistaken for mediastinal pleuritis. Experience shows that bronchiectasis is always present in such shrunken lower lobes. Only bronchography shows the true situation, and without it often cardiac lobe or another accessory lobe is assumed, while such lobes in reality are exceedingly rare.

Among the author 100 children, had shrinkage of one whole lung. Thirty five of the 90 remain in good shape and shrinkage of one or several lobes, always the lower lobe and sometimes the lower and the middle lobe. In 11 of these 35 cases, foreign bodies were the cause of the disease.

While foreign bodies are found in the right lung about twice as often as in the left, for various anatomical reasons, bronchiectasis of the lower lobe is more frequent on the left side than on the right. This shows that foreign bodies probably are not the main cause of bronchiectasis in general, and suggests that the better expectoration from the right side, for the same anatomical reasons, prevent the stagnation of secretions and the formation of bronchiectases on that side to a certain extent. Regular follow-up studies by bronchography in cases of bronchiectasis will increase our knowledge of the pathophysiology of this disease and will enable us to pick up the tendency to and progress or regress in the individual case, and thus promote our prognostic and possibly our surgical therapeutic efficiency.

HENDRICK LAW, M.D.

Fisher A. M. and Flannery G. G. Lung Abscess. An Analysis of 88 Cases. *Bull. Johns Hopkins Hosp. Balt.*, 940, 66, 293.

Lung abscess carries high mortality and the treatment remains far from satisfactory. A group of 88 patients with lung abscess was analyzed in the present report, with special emphasis on the results obtained with the various types of treatment employed.

Lung abscesses complicating other pulmonary diseases such as lung tumors or tuberculosis are not considered, and no effort is made to separate the cases of pulmonary gangrene from those of abscess, for in the opinion of the authors no clear-cut dividing line exists.

Eighty three of the 88 patients were adults. The duration of the disease influences the prognosis as indicated by the fact that the duration of the disease in successfully treated patients averaged one and eight-tenths months, while unsuccessfully treated patients had suffered from the disease for an average of three and six-tenths months. Contrary to general belief in connection with the location of lung abscess, in the present series, there were slightly more abscesses located in the upper lobes than in the lower

The controversy as to whether a piration or embolism is the first step in abscess production still exists. Experimental and clinical data presented by others are reviewed and discussed in detail, particularly references being given to the work of C. Ueber Schleier and Weidheim and Crow. The authors are of the opinion that the most important factor leading to lung abscess is telestasis, resulting from the plugging of bronchus either from mucous, purulent material, or foreign body. In the thorax series 40 per cent of the lung abscess cases followed pneumonia, 9 per cent followed upper respiratory infections, 15 per cent occurred after thorotomy or dental extraction, 3 per cent came on after abdominal or other operations and the preceding factor was unknown in 16 per cent.

The bacteriology of lung abscess is complicated. Cultures taken from the abscesses directly reveal mainly aerobes some strictly anaerobic and others facultatively anaerobic. The authors believe that it is probably necessary to have more than one type of organism present for the production of a symbiotic condition before a lung abscess will develop. The importance of the combination of spirochetes and fusiform bacilli is still a controversial subject. In the present series the organisms most commonly found in pus obtained by means of the bronchoscope are the aerobic alpha hemolytic (*Streptococcus*) *Streptococcus*. From the abscesses themselves are anaerobic and facultative anaerobic organisms predominated, and of these are *Streptococcus*. Direct means showed spirochetes and fusiform bacilli in many instances but were thought to be of secondary importance. A gram negative bacillus, probably bacillus melanogranosus was cultured in fair percentage of cases.

The symptoms and signs in the present series are rather typical. Hemoptysis in 26 per cent, chest pain in 40 per cent, profuse perspiration in 63 per cent, and pulmonary signs in less than half of the cases. A differential diagnosis must rule out pulmonary tuberculosis, carcinoma of the lung or bronchus, bronchiectasis and emphysema. Carcinoma is the most difficult condition to eliminate because frequently an abscess is a complication of carcinoma. Roentgenographic and bronchoscopic studies prove helpful in many cases.

Prophylaxis is of extreme importance in the prevention of lung abscess. This prophylaxis consists of the eradication of nose-throat and mouth infection, especially before an operation. Patient should be placed in positions favoring drainage of the bronchial tree during and following operation. Large doses of sedatives are to be avoided. Postoperative carbon dioxide and oxygen inhalation should be given to hyperventilate the lungs.

In regard to medical treatment régime should be followed to build up the patient resistance. Expectorants and steam inhalant are useful at times. Arsenicals are used in small amounts only in cases in which spirochetes and fusiform bacilli are found in quantities. The routine use of arsenical has proved disappointing. Sulfanilamide or sulfapyridine would

be tried early, although it is questionable whether these drugs will influence a fully developed abscess. Postural drainage is of utmost importance when it can be obtained. Phrenic paralysis and pneumothorax are useless, except that the latter treatment may be used in an occasional carefully selected case.

Surgical treatment consists of external drainage of the abscess done preferably in two stages. A rib resection is carried out and the wound packed with gauze for at least forty-eight hours. The abscess cavity is then opened widely with the actual cautery and the cavity packed with gauze. Lobectomy is advised against in most cases because of the poor results. Surgical therapy should be undertaken in from three to five weeks if no definite improvement is observed after that period of medical care.

In the authors' series of cases there is a mortality of 41 per cent. It is believed that more prompt, better coordinated treatment will reduce the mortality in lung abscess.

LUTHER H. WOLFF, M.D.

Kagan, M. I. The Operative Evaluation of Therapeutic Measures, and Their Remote Results in Empyema of the Chest in Children. *Vestnik khir.*, 1939, 58: 405.

The following conclusions are based on observations of 540 cases of suppurative pleurisy in children under thirteen years of age.

Empyema of the chest in children is a grave condition with a high percentage of mortality and is par-

ticularly serious in infants and children under three years of age. Diplococci are the bacteria most frequently responsible for empyema in children. In such cases the course of the disease is milder than in conditions caused by streptococci, staphylococci, or mixed infections. Paracentesis and roentgenograms are suggested as a means of early recognition of an empyema.

The type of bacteria responsible for the condition, and also the age of the patient are the guides in selecting the proper operative procedure. If diplococci can be demonstrated, repeated aspirations are recommended, but if they do not yield satisfactory results, a closed thoracotomy without a rib resection should be performed not later than three or four weeks after the onset of the condition. If, however, the patient is an infant and diplococci are present, the treatment should be limited to repeated aspirations. Streptococcal, staphylococcal, and mixed infections demand a closed thoracotomy without a rib resection, after preliminary aspirations of the pus. An open thoracotomy with or without rib resection should not be performed in children unless a putrid infection of the pleura is present.

The siphon drainage method of closed thoracotomy is preferable to other methods.

Irrigation of the pleural cavity with antiseptic solutions does not offer any particular advantages and in view of occasional complications is not recommended by the author.

JOSEPH H. NARAT, M.D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Quigley T. R. Inguinal Herniorrhaphy in the Aged. *New England J Med* 1940, 660.

One hundred consecutive cases of inguinal herniorrhaphy were studied from the records of the Peter Bent Brigham Hospital, in which operation for inguinal hernia was carried out in patients over the age of sixty-five. Ninety-six patients were men and 4 were women. 134 hernias were repaired in 100 operations through 30 incisions. There were almost exactly the same number of right and left hernias. The proportion of indirect to direct hernia

approximately two to one. Eight cases are recurrences after previous operations. In 3 cases there were bilateral hernias. Four sliding hernias occurred in the series. There was one operative death which was due to pulmonary embolism.

In 10 cases operation was imperative for incarceration in 7 and for strangulation in 3. All the patients recovered only 3 developed complications.

Nearly three times as many wound complications and recurrences occurred when catgut was used as when fine silk was employed. The same incidence of complications followed the repair of multiple hernia in stages as in single operations.

Novocaine nerve block anesthesia was followed by the lowest incidence of postoperative complications. The Bassini type of operation was the most satisfactory from the point of view of recurrence. There was no correlation between the incidence of complications or recurrence and the operating time, the experience of the surgeon, concomitant disease, and the age, weight, or blood pressure of the patient.

Inguinal herniorrhaphy, whether elective or imperative is a safe and satisfactory procedure for the aged patient when carried out under novocaine nerve-block anesthesia, with the minimum of pre-operative medication and with fine silk as the suture material. CHARLES BROWN, M.D.

Arnold, L. E.: Pneumococcal Peritonitis. *Surgery* 1940, 7, 555.

The present status of pneumococcal peritonitis reviewed and a typical case presented. This case was carefully followed both from a clinical and a laboratory point of view. The Type V pneumococcus was first found in the vaginal exudate and rising the existence of an acute generalized peritonitis. This organism was then found in the sputum, blood, and later the abdominal and pleural exudates.

There was employed in this case a new type of treatment which had previously been used successfully in several cases of bacteremia by Crocker, Valentine, and Boddy. A suitable donor was given 50,000,000 killed typhoid bacilli intravenously and 50,000,000 were injected one hour later. At the end of seven hours the lingual temperature was 101.

and the blood revealed 4,000 leucocytes per cmm. At this time 500 ccm of blood were withdrawn and injected into the patient with pneumococcal peritonitis. Within twenty-four hours there was a dramatic response and the patient roused from her moribund state. Twelve more of these immunotransfusions were given in forty-eight hours in intervals. Following these transfusions, the patient was then operated upon and a large quantity of thick purulent exudate was evacuated from the abdominal cavity. A left empyema was also drained a short time later. Recovery was complete.

It is earnestly believed that this treatment by controlled non-specific immunotransfusions is solely responsible for the recovery of this patient. She not only failed to improve under penicillin and specific serotherapy but her condition became worse during their use. SAMUEL H. KATZ, M.D.

Joffe, J. L.: The Surgical Anatomy of the Arterial Blood Supply to the Small and Large Intestines. *Annals Surg* 1939, 109, 333.

In 63 cases the author used Black's method of roentgenography of the intestinal arteries after an injection of radiopaque substances.

The intestinal tract receives its blood supply from so-called parallel or marginal arteries located in the mesentery. So-called vasa recta branch out at right angles from these structures and enter the intestinal wall. In the small intestine numerous ramifications of the vasa recta are observed, and they form anastomoses with branches of the adjoining vasa recta. On the other hand, in the ileum of the large intestine such anastomoses are minimal and their size and number

Injury to the arterial vasa recta may occur in the course of an intestinal resection and, as a result, the blood supply of the corresponding triangular zone suffers. In order to secure an end-to-end anastomosis it is advisable to place sutures not through this dangerous area but through a junctional region of the intestinal wall. If the section of the intestine is made at an angle of about 45 degrees the aforementioned triangles with impaired blood supply are removed with the resected segment; therefore the type of resection of the small intestine is recommended by the author. On the other hand, the peculiarities of distribution of the blood vessels in the wall of the large intestine suggest a perpendicular section.

Appendices epiploicae receive their blood supply from vasa recta and therefore the removal of such formations may be followed by injury to the artery.

The resulting disturbance of nutrition of the corresponding segment of large intestine is discussed. If an appendix epiploica cannot be preserved, the corresponding portion of the intestine should be slightly inverted to suit. The danger of impair-

ment of the circulation in the wall of the large intestine after the removal of an appendix epiploica is considerable, in view of the fact that the vasa recta frequently form loops in these structures. It has been suggested that the vitality of the large intestine may be tested after a ligation of the mesocolon by removing the corresponding appendix epiploica and watching for bleeding from the stump. The author is opposed to this test in view of the aforementioned danger arising from ligation of a loop of the vasa recta when the appendix epiploica is removed.

JOSEPH K. SARAT, M.D.

GASTRO-INTESTINAL TRACT

Kornblum, K., and Fisher, L. C. Carcinoma as a Complication of Achalasia of the Cardia. *Am J Roentgenol*, 1940, 43, 364.

"Achalasia," meaning "absence of relaxation," refers to those lesions of the esophagus in which there is dilatation and hypertrophy with no evidence of obstruction distal to the dilatation. The authors of this article tend to the view of Hurst that the abdominal esophagus and that part of the esophagus a short distance above the diaphragm is a true sphincter which, for some reason, fails to relax during the act of swallowing. Numerous theories have been advanced to account for this fact with a good deal of attention having been directed to lesions of Auerbach's plexus of nerves surrounding the structure.

In general, the complication of carcinoma of the esophagus has not been greatly stressed by other writers but the author has noted 2 such complications. The fact that in the advanced condition there is a considerable amount of food and liquid retained in the esophagus, until the hydrostatic pressure causes it to be pushed through into the stomach, gives an excellent opportunity for irritative processes to take place. Exactly this thing happens and the mucosa is often found to be very red and inflamed. Occasionally nearly all the mucous membrane is ulcerated away, but generally there are islands of tissue which hypertrophy and could easily be the seat of an early malignancy.

The history is usually that of increasing difficulty in swallowing over a period of years, although occasionally the onset is quite abrupt. Dysphagia is intermittent at first but subsequently becomes more or less constant. While this is the outstanding symptom there are others which serve to produce a definite clinical picture. Regurgitation is a fairly common one. Vomiting does not occur and there is no nausea or retching. The regurgitated material contains unchanged food and mucus but no free hydrochloric acid. Other symptoms include substernal pain, respiratory symptoms such as cough and dyspnea and excessive salivation.

The diagnosis should be established by x-ray examinations, passage of bougies, and direct examination with the esophagoscope. Roentgenologically, the typical case offers no difficulties. There is first an obvious obstruction of the lower end of the

esophagus, with marked dilatation of the thoracic esophagus unlike that seen in any other condition. The lower esophagus presents a smooth funnel-shaped contour which at times may be angulated but does not present the irregular filling defect seen in cancer. When the condition is marked the esophagus may become tortuous and bulge forward and to the right beyond the cardiac shadow. Frequently the contents will not pass into the stomach until a column high enough to overcome resistance at the cardia is obtained. In the lower part of the chest, just above the diaphragm, there will be noted a triangular shadow with the apex pointed upward. This is due to the shadow of the dilated fluid filled esophagus superimposed on the cardiac shadow.

In particular, the author most strongly urges that each case be esophagoscoped in order that an accurate diagnosis be made. He believes that in no other way is this possible. He cites several cases, in one of which the x-ray diagnosis was that of achalasia but examination with the esophagoscope showed a neoplasm to be present. In 2 other cases neoplasms developed in typical cases of achalasia after a period of several years. These 3 cases illustrate the necessity for study with the esophagoscope.

JOHN WILSON LEVON, M.D.

Novikov, G. M. Novocaine Bloc in Acute Intestinal Obstruction. *Vestnik Khir*, 1939, 58, 506.

The author considers a novocaine bloc as the most important conservative measure in the treatment of acute intestinal obstruction. Approximately one third of all patients with this condition do not require an operation and among them those with a dynamic ileus form the majority. A disturbance of innervation of the digestive tract is responsible for the dynamic type of ileus and therefore spinal anesthesia seems to be indicated from the pathogenic point of view. Nevertheless, the author is strongly opposed to this type of anesthesia in view of the possibility of grave complications. He prefers a novocaine bloc, which in all probability has an effect on the autonomic nervous system similar to that of spinal anesthesia.

Among 139 patients with acute intestinal obstruction, 63 were operated upon while 76 recovered after the conservative treatment. Even if a surgical procedure is required, conservative treatment is worth while trying before the operation if the time and condition of the patient allow. If there are no signs of peritonitis and the general condition of the patient allows expectant treatment, the patient is brought to the operating room where a right or left lumbar novocaine bloc is performed. With regard to the age and weight of the patient from 50 to 100 cc. of a 1 per cent solution of novocaine are introduced.

In 46 patients the occlusion disappeared after the employment of the novocaine bloc alone. Abdominal pains usually subside after from twenty to sixty minute status is passed the abdomen becomes soft and palpation is painless. Usually, a decaction takes place and the patient falls asleep.

In 3 patients the novocaine bloc failed, while an enema followed by sponging of the introduced fluid removed the obstruction. In some cases pain subsided but flatus was not passed. In 2 of such cases an enema was employed with success. The author is convinced that the enema alone could not have produced this effect.

If within one hour after the novocaine bloc the obstruction does not disappear and the enema also fails, a diagnosis of mechanical obstruction is made and an operation performed.

Apparently the novocaine bloc acts on the spastic as well as on the paralytic ileus. This paradoxical fact is in agreement with experimental findings pointing to the ambiprotic character of various substances which may act on the sympathetic as well as on the parasympathetic system.

The unusually high percentage of recoveries after the conservative treatment viz. 55 per cent, suggests the possibility of the efficiency of the novocaine bloc in the early stages of mechanical obstruction. Not only can mechanical obstruction be replaced by a dynamic ileus but, conversely, a dynamic obstruction may be replaced by the mechanical type. Probably the initial irritation leads to dyscinesia of the intestinal tract followed by a dynamic and later by a mechanical ileus. Novocaine bloc is able to remove edemas of inflammatory, toxic, or traumatic origin and this action is probably responsible for the not infrequent effect of this type of anesthesia on mechanical obstruction.

JOSEPH K. NAR, M.D.

Krowe, L., and Schiff, F.: Paradosurgical Syndromes Produced by *Salmonella* Organisms. (*Am. J. Digest. Dis.* 949, 7, 76).

Spontaneous cases of infection from the salmonella group of bacteria may simulate the clinical picture of acute intra-abdominal surgical infection so that surgical intervention may be carried out on mistaken diagnosis. The danger of such mistakes lies in the fact that the individual so infected may be a source of infection which may result in an epidemic of the disease.

Two cases are reported in detail. One case was that of a twenty-six year-old man who had symptoms which included generalized abdominal pain most severe in the periumbilical region, vomiting, and loose bowel movements. There was definite tenderness and rebound tenderness in the lower abdomen. Three days after the onset, laparotomy was performed under the impression that the condition was cut appendicitis. At operation there was free clear yellow fluid in the peritoneal cavity and moderate inflammation of the serosa of the ileum as observed. The appendix showed no inflammation. Postoperatively examination of the feces showed salmonella typhimurium. Specific agglutinins were found, which confirmed the diagnosis.

The second case reported was that of a fifty-five year-old white woman who was admitted with a history of abdominal pain, mostly localized to the peri-

umbilical region and to the right lower quadrant. The onset of the condition was accompanied by fever of 38.5°C and vomiting occurred on 4 occasions. Physical examination revealed a tender right upper quadrant, but most marked abdominal finding being extreme tenderness on the right side. The abdominal signs became localized in the right upper quadrant. The patient was prepared for operation in the surgical ward with the diagnosis of acute cholecystitis or acute appendicitis but, because of the development of an apparent bronchopneumonia, operation was delayed, and on admission to the hospital the patient stool a positive culture for salmonella, paratyphoid C group, as found. The organism was also isolated from the duodenal drainage. The bacteria were identified as salmonella muenchen, this being the first time that infection by this organism has been reported in the Western hemisphere so far as is known.

It is advisable for the clinician and especially for the surgeon to pay attention to salmonella infections, according to the authors. By doing so an unnecessary laparotomy which may endanger the patient may be avoided.

LATHEA H. WOLFE, M.D.

Masciottra, R. L.: Primary Carcinoma of the Duodenal Bulb (*Carcinoma primitivo del bulbo duodenal*). *Rev. med. quirurg. de São Paulo* 949, 5, 72.

Masciottra states that primary carcinoma of the first portion of the duodenum is extremely rare. He reports a case in a woman, aged fifty-four years, who began to have vague disturbances ten years previously and whose condition became rapidly worse during the past four months. The tumor was removed and the histological diagnosis was adenocarcinoma. The patient died twenty-four hours after the operation.

Primary carcinoma of the duodenal bulb constitutes a well defined anatomical and clinical entity among the epithelial neoplasms of the duodenum, which are divided into those of the duodenum proper and those of the ampulla. The former are subdivided into supra-ampullar and infra-ampullar tumors. Various theories have been offered to explain the origin of duodenal cancer: development in an aberrant island of gastric mucosa or pancreatic tissue, in an old diverticulum of the duodenum, in a duodenal ulcer or in Brunner glands.

The tumor is nearly always diffuse and more or less encasing, and infiltrating. Histologically it is an adenocarcinoma or an alveolar carcinoma. Various degenerations may occur followed degeneration being the most frequent. Cystic cavities with a gelatinous-like mucoid content are not infrequently found in the tumoral mass. The participation of the stroma in the tumor arises. The tumor nearly always contracts adhesions with the neighboring organs, particularly the pancreas and the gall bladder. Metastases seem to be frequent, especially to the liver.

The clinical picture of carcinoma of the first portion of the duodenum is not characteristic and this explains the frequent errors in diagnosis. There are general symptoms, such as loss of weight and strength, anorexia, flatulent dyspepsia, and anemia. Pain in the right hypochondrium two or three hours after meals, accompanied or not by nausea and vomiting, occurs some time or other, and subicterus may be present. Hematemesis and melena are very rare. A choledochus syndrome appears in cases of compression of the biliary tract. At times, the disease starts suddenly with great epigastric pain and symptoms recalling obstruction of the pylorus. Clinical examination offers nothing characteristic, but a tumor may be found in some cases on palpation, usually when the neoplasm has already invaded neighboring organs and contracted adhesions. Ascites is rarely present. Laboratory examinations offer no sure elements for the diagnosis. Theoretically, duodenal sounding may be of value, practically, it is not. The same applies to roentgen examination in advanced cases, the most frequent diagnosis is that of antropyloric tumor. In short, the diagnostic difficulties are such as to make an operative diagnosis difficult or impossible.

Surgery is the only treatment to be considered. Unfortunately, many cases come to operation in the advanced stage and the immediate mortality is consequently high, in addition, recurrences are frequent within four or six months. In cases favorable from the surgical point of view, ample gastroduodenal resection may give good immediate and late results.

RICHARD KEMEL, M D

Sorce, G The Morphology and Functional Capacity of the Gall Bladder in Acute Appendicitis (Morfologia e funzionalità della colecisti nell'appendicite acuta) *Arch ital di chir*, 1939, 57 392

Sorce recalls that a physiological or pathological stimulation in a certain part of the body may cause a reflex reaction in some other distant part and that this reaction may be of sensitive, sensorial, motor, or secretory nature. In abdominal pathology, a lesion localized in one of the visceral organs may determine notable functional changes in other segments of the digestive apparatus. The author has made a study of the morphology and the functional capacity of the gall bladder in acute appendicitis by means of cholecystography and Bronner's test in 21 patients immediately after the attack of appendicitis or during the period of remission, none of these patients had previously suffered from any hepatobiliary disorder.

The results of cholecystography were completely negative in 3 cases and absolutely normal in another 3. As to the remaining cases, there was retardation of the injection of the gall bladder with a pale atonic shadow in some, even when the rapid method of Antonucci was used, and simply a pale atonic shadow in others, in 1 case the shadow was small, atonic, and displaced medially. Bronner's test revealed more or less retardation of the elimination in 5 cases.

Seven of the patients were submitted to laparotomy and systematic exploration of the abdominal organs, and especially of the biliary tract. In 4 the gall bladder showed signs of recent changes, these consisted of thickening and vascular injection of the vesicular serosa and, in 2 cases, of well vascularized and easily detachable adhesions between some part of the gall bladder and other organs, the epiploon and a loop of the small intestine in 1 case each. In the other 3 the gall bladder did not show any macroscopic changes (1 with congenital alterations).

The fact that injection of the gall bladder may not occur in cholecystography because of the presence of a disease in other organs has been reported by some American authors, who have mentioned gastric or duodenal ulcer, gastric carcinoma, renal sclerosis, pyelitis, cystitis, Basedow's disease, and diabetes. At present, no explanation can be offered for this phenomenon. As to the other cases, severe changes of the mucosa may give an intense shadow, but a pale shadow as well as other signs of dysfunction, such as retardation of the injection, atonic gall bladder with vague contour, and retardation of evacuation, are not solely the expression of the anatomical condition of the organ, other factors must play an important part in the course of the test and it is evident that the effects of the nervous correlation between the gall bladder and other parts of the digestive tract will vary from case to case and depend on the intensity of the stimulation and the basic tone of the sympathetic nervous system. The presence of inflammatory changes in the gall bladder, found at operation and coinciding with acute appendicitis, shows that the morphological and functional changes of the organ must be caused by its participation in the inflammation of the appendix, even if this participation is only of slight degree. Besides, numerous observations of associated appendicitis and cholecystitis have been published.

On the basis of his own studies and of those of others, the author thinks that the disturbances noted must be attributed to the initial inflammation of the biliary tract even in cases in which no macroscopic lesions of the gall bladder are found at operation.

RICHARD KEMEL, M D

Iesu, G The Gall-Bladder Syndrome on the Basis of Subacute Recurrent Appendicitis in the Presence of an Ectopic, Subhepatic Cecum (Sindrome colecistica da appendicite subacuta ricorrente, con distopia cecale sottoepatica) *Riv di chir*, 1930, 5 436

The author reports a case in which the ileocolic loop was fixed in the right upper quadrant and associated with inversion of the cecum. The patient, a woman of forty-eight years and a native of Naples, complained of right hypochondriac pain occurring one half hour after meals and accompanied by fever of remittent character. Analgesics failed to relieve the pain which radiated to the right arm and shoulder and was elicited by the ingestion even of

liquids. The past history was recent and the patient gave no history of constipation.

Physical examination revealed a rather poorly nourished individual who manifested subicteric tint and pallor of the mucous membranes. Marked tenderness was noted over the gall bladder where small tumor mass was felt. The abdomen as otherwise not remarkable. Roaring sign was absent. Visualization of the gall bladder was normal and no stones were seen.

While in the hospital, the patient underwent another attack of right upper quadrant pain, with elevation of the temperature and retching. A laparotomy was performed on the following day and the terminal loop of the ileum was found to be adherent for distance of from 8 to 10 cm. to the posterior wall of the peritoneal cavity and to join the cecum from above downward after describing a circle. The cecum too, was adherent to the parietal wall and became continuous with the ascending colon in such way as to form a horseshoe with the convexity facing superiorly. The appendix was approximately 10 cm. in length and gave evidence of a subacute inflammatory process. It descended tortuously and was separated from the gall bladder by small piece of omentum in which served to establish a cholecysto-appendiceal adhesion. The gall bladder and ducts were otherwise normal. Simple appendectomy was performed, with complete relief of the symptoms.

The above analyzes displacements of the cecum and terminal ileum according to the work of Alglave in 1907 who found the ileocolic loop to be situated in the lumbar fossa in 3 cases, in the iliac fossa in 74 cases, and in the pelvis in 3 cases, all possible modifications of the length of the mesentery being present. Although it was impossible to exclude acquired displacement in which an abnormally mobile ascending colon was dragged superiorly and fixed secondarily by inflammation. It seemed more probable that the anomaly was congenital. The clinical picture produced by this entity is not well defined, and is characterized by obstinate constipation, attacks of right upper-quadrant pain with a sense of pressure in the epigastrium and right flank, and various dyspeptic symptoms. These symptoms however are by no means invariable and the differential diagnosis is manifestly difficult. Therapy ordinarily consist of simple appendectomy. Interference with the anomalous structures is not recommended.

EDITH FARNWORTH, M.D.

Mayo, C. W., and Miller, J. M.: The Surgical Treatment of Sigmoidovesical Fistulae. *Arch Surg* 94: 4-89.

Diverticulitis with perforation is perhaps the leading etiological factor in the production of sigmoidovesical fistula. The formation of this type of fistula is an extremely serious complication in patients with diverticulitis or other inflammatory conditions, and the mortality from one stage surgical procedures for the correction of the fistula due to diverticulitis is excessive.

Keeping the facts learned from other surgical procedures on the bowel in mind, multiple stage operations are most satisfactory in dealing with this particular type of fistula. Colostomy which obviates spillage from the upper into the lower part of the colon is usually the first stage and it should be performed as close to the fistula as practicable in order to avoid redundant bowel above the rectocolic tract. A sufficient interval should be permitted to elapse after preliminary colostomy to allow spontaneous healing of the fistula. If it does occur, if it occurs the colonic stoma should not be closed until one is positive that the inflammation of the sigmoid has completely subsided, else there will be a recurrence.

When carcinomatous invasion from the sigmoid colon into the bladder has occurred and sigmoidovesical fistula has formed, the prognosis is extremely poor. Ascending infections of the urinary tract are not very common complications of vesico-sigmoidal fistula.

Crow, H. E. A., and Dulin, J. W.: Congenital Anomalies of the Anus and Rectum. *Surgery* 60: 7-379.

Congenital malformations of the anus and rectum occur about once in every 1,000 births. Most of these are due to errors or abnormalities of development arising in the seventh or eighth week of embryonic life. At the University of Iowa Hospitals during the past five years there have been 23 cases of anorectal anomalies, an incidence of 1 in 5,300 admissions. All of the cases may be grouped into 5 categories.

Type 1. Incomplete rupture of the anal membrane or stenosis at point from 1 to 4 cm. above the anus (3 cases) (male 2 female).

Type 2. Membranous imperforate anus (6 cases) (5 male 1 female).

Type 3. Imperforate anus with rectal pouch separated from it (6 cases) (3 male 3 female).

Type 4. Normal anus and anal pouch, rectal pouch ending blindly (male).

Type 5. Partial or complete absence of the anal sphincter (females).

In 7 instances fistulae are present between the rectum and the genito-urinary system or perineum.

In 3 cases associated congenital malformations are present, the most frequent being congenital club-foot and deformities of the hand.

In 4 cases restoration of normal function to the anus and rectum was accomplished. In 3 cases obstruction was overcome but some anal or rectal distention remained. In 1 case no improvement occurred and in 1 instance the end result is not known.

Ten of three cases are treated surgically with 4 operative deaths. The patient died subsequently one from congenital heart disease and the other from testicular obstruction. In this group satisfactory result obtained in more than 65 per cent of the cases.

The method of treatment varies according to the type of anomaly. When an associated fistula sufficient in size to allow passage of the fecal stream is present, the condition may not be recognized until regional examination is made.

Relief of the obstruction is the most important part of the treatment. In the debilitated infant with a high-lying rectal pouch the performance of a double-barreled colostomy is the safest procedure. In such circumstances the colostomy is not only life-saving but is of value in allowing subsequent visualization of the distal, blind loop of bowel. Primary colostomy is always indicated when a rectovesical fistula is present. At a later date, when the patient's general condition is satisfactory and the anatomical structures are more fully developed, plastic procedures may be performed. It is desirable to delay complicated reconstructive procedures until the patient is eight or ten years of age. Even after long periods of non-use, proper utilization of the anal sphincters usually results in satisfactory bowel control. Many fistulous tracts will close spontaneously after a satisfactory proctoplasty or colostomy. The complete relief of bowel obstruction is a prerequisite for the successful operative closure of a fistula. An adequate fistulous opening without incontinence is better than a malfunctioning, normally located anus.

MANUEL E. LICHTENSTEIN, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Varela Chilense, R. The Problem of Residual Lithiasis of the Common Duct (El problema de la litiasis residual del colédoco). *Rev méd-quirúrg de patol femenina*, 1940, 15: 112.

The problem of residual lithiasis of the common duct is a very important one because the best statistics show it to occur in almost 15 per cent of the operations on the biliary system, and some surgeons report 30 or more per cent.

The causes of this condition are (a) the failure of extraction of a stone placed very high in the biliary tree which later on migrates to the common duct, (b) the impossibility of ascertaining the existence of a stone because of a lack of manual or instrumental exploration or a defect in the radiological exploration, (c) the necessity of shortening the operative procedure in urgent cases or in serious chronic conditions, and (d) the possible migration of small stones through a dilated cystic duct produced by the exploration and evacuation of the common duct.

The author believes that the best prophylactic measures are a careful and thorough operative exploration of the biliary duct and its ramus so as not to overlook any stone, which can later be the origin of a so-called residual lithiasis of the common duct.

The exploration can be made by means of supra-duodenal choledochotomy, a manual and instrumental exploration of the biliary duct, an injection of fluids into the choledochus, a dilatation of the sphincter of Oddi, or a papillotomy.

The author recommends the ligation of the cystic duct previous to the choledochotomy as a prevention against the migration of a cystic stone. The operative cholangiography, proposed by Minzzi, has been accepted by many surgeons, and is one of the most effective methods to overcome the difficulties of the exploration, however, it requires a radiological operative table, which is not always found in every operating room.

Diagnosis is a postoperative problem and it can be made in two conditions: when the common duct is drained by a Kehr's catheter or when there is no drainage.

If a catheter is available the diagnosis is easier.

1. The occlusion of the T catheter brings pain in the right hypochondrium and fever, and if one insists discoloration of the feces, jaundice, and negative duodenal catheterization.

2. Velasco Suarez places a colored fluid into the catheter (1 per cent solution of mercurochrome), the fluid must pass into the duodenum in from thirty to sixty seconds and any delay can be taken as a sign of the existence of mechanical obstruction.

3. Walters, Butsch, and Gowans have studied the canalicular pressure (normal 0 to 6 cm. of water).

4. The postoperative cholangiography is very valuable in determining if the patient must or must not be re-operated upon.

In case there is no Kehr's catheter in the common duct, one must consider the following conditions:

1. The persistence of a biliary fistula with or without acholia and with negative duodenal soundings.

2. Attacks of pain, fever, and jaundice coinciding with an interruption of the external biliary flow.

3. The radiological study of the fistula injecting a contrast medium through a Nelaton's catheter introduced in the fistula.

There are many procedures for the treatment of this condition. They can be medical or surgical.

The medical means are:

1. Solvents of the stones, like ether.
2. The mechanical action of large transcholedochus washings with saline solution.

3. The lubrication with vaseline or paraffine oil, which facilitates the descent of the stones.

4. The aspirative action of the duodenal catheterization.

5. The antispasmodics like nitroglycerine, atropine, acetylcholine.

The mixed procedures, as advocated by Pribram,* consist of the injection into the common duct of an ether-paraffine mixture which combines the dissolving and the lubricating action.

The author thinks that, if after from forty to sixty days of medical treatment there seems to be no progress in the state of the patient, one can decide upon an operation. The failures of medical treatment are not to be considered contraindications to its use, because even one successful result is enough to keep it as a valuable means of relieving this difficult situation.

Referring to the surgical treatment the author follows the technique of Benjoles, which, briefly consists in spinal anesthesia (15 more or less than 4 mgm. of percaline). An incision from 5 to 8 cm. long is made on the operative scar, with its middle part on the opening of the fistula. Following the T catheter the different heat of the abdominal wall are set apart. The common duct appears to be very near to the wall and it is very easy to reach the opening of the choledochotomy following the tube. Once reached the catheter is extracted, and the stones which have been previously localized by the cholangiography are taken out. Once the permeability of the duct is re-established, the surgeon can close the choledochotomy or drain it again.

Hectoro Manno, M.D.

Loi, W.: Suppurative Pancreatitis (Sella pancreatitidis suppurativa). *Sarimasa med.* 940, 3-09.

Loi describes 11 cases of suppurative pancreatitis. The first was found in a man, aged thirty-two years, who had suffered from dyspeptic disturbances for the past six years. These disturbances were accompanied by fever and occurred at long intervals under the form of short attacks. One year before death symptoms of biliary obstruction and infection occurred and the presence of tumoral mass was discovered in the mesogastrium shortly before death. Necropsy revealed two large peripancreatic and pancreatic abscesses, chronic interstitial pancreatitis, compression of the choledochus and of Wirsung duct, glomerulitis, and splenic tumor.

The second case, that of a woman, aged forty-four years, who had previously undergone choledochotomy and cholecystoduodenostomy and presented intense icterus, a roentgen diagnosis of tumor of the head of the pancreas had been made. Necropsy revealed scirrhous cancer of the pancreatic head with involvement of the vena porta and phlegmonous pancreatitis.

The author finds the classifications of pancreatitis given by various writers inadequate and proposes the following morphological classification:

- I Acute pancreatitis
 - A Simple (parenchymatous, interstitial, and mixed)
 - B Purulent (with small multiple foci with large foci, phlegmonous, gangrenous, the steatonecrosis)
 - C Necrotizing hemorrhagic
- II Chronic pancreatitis
 - A Primary sclero-atrophic (circumscribed and diffuse)
 - B Lithiasis sclero-atrophic
 - C Sclerohyperplastic (circumscribed and diffuse)

To this general schema could be added the elements derived from the histological examination which would show various types of chronic pancreatitis which depend on the prevalent distribution of the connective tissue peribubular intralobular acinar perivascular and nodular.

Suppurative pancreatitis is caused by the ordinary pyogenic bacteria or by other pathogenic bacteria which may assume pyogenic characters. The bacteria may reach the pancreas by the ascending canaliculi, the circulatory or the lymphatic route or by direct inoculation. It is easy in many cases to determine the route by which the bacteria have attacked the pancreas. In others, it is obscure. Various factors prepare the pancreatic terrain for the invasion of the bacteria: excessive and incongruous feeding, obesity, syphilis, tuberculosis and, especially, biliary lithiasis and intestinal worms. The route most commonly taken by the bacteria is the ascending canaliculi and the conditions which most frequently favor the access of the bacteria to the pancreas are biliary and pancreatic lithiasis, the tumors or the inflammatory processes developing in the organs or around its ducts. Therefore the abscesses are usually found in the head of the pancreas and less frequently in the body or the tail, and, hence, we have DeJardin's "triangle of infection," the base of which lies between the major and minor canaliculi, while the apex traces the junction of the ducts of Wirsung and Santorini.

From the symptomatological point of view suppurative pancreatitis presents hyperacute, acute, subacute and chronic forms, and its course is related to the complications which may accompany the primary form. It is difficult to make the diagnosis with certainty and the prognosis is almost always pessimistic. The treatment is always surgical.

Ricardo Krieger, M.D.

Milhet, Dormay and Frey: Cancer of the Body of the Pancreas of Tumoral Form, Treated by Subtotal Pancreatectomy (Cancer du corps du pancréas à forme tumorale traité par pancréatectomie subtotale). *Mém. Clin. de la Fac. Par.* 1928, 66-5.

Milhet, Dormay and Frey report a case of cancer of the pancreas of an unusual type in that the growth was a tumor implanted on the pancreas rather than infiltrating the organ. They find only a few other cases of this type reported in the literature. In their case the patient, a woman, thirty-four years of age, when she first came under observation at that time symptoms of epigastric pain and frequent vomiting had been present for about six years and he had lost weight rapidly. She was under observation for three years, during which time the symptoms subsided to a considerable degree. About one operation was not done. At that time the symptoms became increasingly severe (three years after the first examination). At operation a large tumor was found which was implanted on the pancreas at the junction of the body and the tail. A subtotal pancreatectomy was done (including the tumor and the body and the tail of the organ) and only the tip of the pancreas was left. The patient showed definite improvement for a period of two months after operation, she then became cachectic and died.

Pre operative roentgenological study in this case showed a compression of the vertical portion of the stomach, which formed a narrow lumen between two cavities (bilocular stomach). There was no ulcer niche or defect in the gastric outline, and the gastric mucosa appeared to be normal. It was evident from the roentgenogram that the obstruction of the lumen was caused by pressure from without. This form of gastric obstruction by a pancreatic tumor is unusual, although obstruction of the pylorus or the duodenum by pressure of a pancreatic tumor is commonly observed. Another point of interest in this case was the long course of the disease, as cancer of the pancreas usually advances much more rapidly. From the histological standpoint the tumor was an epithelioma of atypical structure, but evidently of glandular origin.

A review of the literature shows that subtotal pancreatectomy has been done in a few cases, with good immediate results. In some cases cancer of the pancreas causes but a few symptoms at onset, but in the case reported the symptoms observed three or four years before operation was performed might have been considered an indication for operation. The possibility of pancreatic involvement should be considered in patients with symptoms of dyspepsia and an unusually rapid loss of weight.

ALICE M. MEYERS

MISCELLANEOUS

Storck, A. H. Penetrating Wounds of the Abdomen. *Ann Surg*, 1940, 111: 775

The author reviews 46 personally managed cases of penetrating wounds of the abdomen, 35 of which were gunshot wounds, and 11 stab wounds. From this report he concludes the following:

Facilities for quick transportation, arrangements to shorten the pre operative duration of the injuries, and provisions for promptly combating shock and hemorrhage are important in the management of penetrating wounds of the abdomen.

The symptoms associated with penetrating wounds of the abdomen are frequently indefinite. Pain is frequently slight or absent. Penetrating wounds of the abdomen which occur via the gluteal, sacral, or perineal regions are particularly likely to be overlooked because of the frequent absence of early symptoms. Physical findings in penetrating wounds of the abdomen may be misleading. Tenderness and rigidity are not constantly present. Examination of the urine for gross or microscopic blood should be made in order to reveal or confirm the presence of injuries of the urinary tract. Red blood cell counts and hemoglobin determinations may be misleading or late indicators of hemorrhage. Roentgenological examination is often of value and assistance in the pre operative determination of probable injuries.

The recognition of associated injuries, particularly those of the chest, is important in the management of penetrating wounds of the abdomen. The study

of wounds of entrance and exit may indicate whether or not penetration of the abdomen has occurred. When there is uncertainty concerning penetration of the abdomen, exploratory celiotomy usually should be performed. Even when the wounds have been produced by small-sized shot, abdominal exploration should be performed.

A short interval between the time of injury and the time of operation usually is favorable in its influence on the outcome, but operations should be delayed until patients have at least recovered considerably from shock. In penetrating wounds of the upper abdomen, operation may be necessary and is relatively safe during a longer period than in wounds which involve the lower portions of the abdomen. Prolonged shock produces irreversible deleterious effects, therefore, attempts should be made to rapidly combat shock and hemorrhage. The extent of hemorrhage largely determines the outcome in penetrating wounds of the abdomen. In the presence of considerable hemorrhage, transfusions during and shortly after operation, and totaling as much as 3,000 c. cm. of blood, may be necessary. Transfusion registries and blood banks are important in making available adequate supplies of blood. Transfusions of blood should, whenever possible, displace the administration of saline or glucose infusions or stimulant drugs.

Spinal anesthesia may be employed to advantage in selected cases.

The ricochet of bullets, as well as variations in the relative position of parts of the patient's body at the time of injury as compared with the position of the same parts on the operating table, accounts for apparently bizarre courses of bullets. Unexpected and unpredictable visceral injuries which proved to be due to the position of the patient, or the phase of respiration at the time of injury, were frequently observed.

The total number of perforations of either hollow or solid viscera was only slightly less in the group which lived than in the group which died. Whenever perforation of one wall of a hollow viscus is detected the opposite wall of the viscus should be examined for possible injury. The mortality rate was unusually low in the group of cases with injury of the large intestine, probably because of the relatively small amount of spillage which accompanies such injuries. Extraperitoneal hemorrhage or hemorrhage between the leaves of the mesentery is likely to obscure important injuries. Injuries of the gall bladder, bile ducts, pancreas, and kidneys are extremely serious. Perforations of the spleen usually require splenectomy. Lacerations of the liver causing hemorrhage may sometimes be sutured satisfactorily, but in other instances hemorrhage from lacerated surfaces of the liver can best be controlled by means of packs. Unrepaired perforations are frequently discovered at autopsy, therefore, re-examination after all perforations are thought to have been repaired is advisable if the patient's condition warrants such a procedure.

Because of the important relationship between hemorrhage and mortality, attention during operation should be directed first to the arrest of bleeding. Time-consuming procedures, such as intestinal resection, should be avoided whenever possible. Mechanical devices for anastomosis should rarely if ever be used. Enterostomy is usually ineffectual, and has been displaced by better methods of preventing or combating ileus. Drains introduced into the peritoneal cavity are usually unnecessary and undesirable, but drainage of the abdominal wall should be instituted when hollow viscera have been perforated. Silk or cotton sutures and ligatures are superior to catgut for the repair of hollow viscera and for the closure of the abdominal wall. Irrigation or lavage of the peritoneal cavity is usually of little value, but it is desirable to suck out or pick out from the peritoneal cavity liquid blood, blood clots, detached particles of viscera, intestinal contents and foreign bodies.

Post-operative attention should include measures to combat any still-existing shock or effects of hemorrhage. The application of heat to the abdomen, the administration of large doses of morphine, the establishment of gastroduodenal suction drainage, the avoidance of enemata and flushes, and the infusion of glucose and lactated Ringer solution are effective measures in preventing or reducing the severity of ileus and peritonitis. The Miller Abbott tube as well as oxygen therapy may be employed to advantage in selected cases. Biological preparations, such as coli-bacterin, and chemotherapeutic agents such as sulfanilamide and sulfapyridine may prove of value in reducing the mortality from peritonitis resulting from penetrating wounds of the abdomen. Desoxycorticosterone acetate or other preparations containing the adrenal-cortex hormone may benefit those cases in which peritonitis is anticipated or already exists. Vitamin should be administered parenterally or orally to favor wound healing and to compensate for the general vitamin deficiency which is likely to develop during the postoperative period. Lymphoid serum or whole blood transfusions are sometimes necessary for the maintenance of plasma protein at normal level during the postoperative period.

Atelectasis and pneumonia frequently complicate penetrating wounds of the abdomen and in view of this fact it is important that measures be taken to prevent or promptly treat these pulmonary complications.

The mortality of penetrating wounds of the abdomen is and will continue to be disappointingly high in the present series the mortality in the tabulated cases was 50 per cent the mortality in the gun-shot wound cases 40 per cent and the combined mortality 37 per cent. However recent advances in the treatment of shock, hemorrhage, ileus and peritonitis which is so important in the management of penetrating wounds of the abdomen, are encouraging.

STUART H. KLEIN, M.D.

Comaresco, A., David, N., and Stannico, C.: Radiology in Free Intra-peritoneal Fluid (Les lésions radiologiques de liquide libre intra-péritonéal). *Prime Méd. Par.* 94: 433.

Although much has been written on the value of fluoroscopy in the diagnosis of intestinal obstruction and perforation of the hollow viscera, little has been said about its value in the diagnosis of the amount and position of free intra-peritoneal fluid. The authors believe that this is a very useful diagnostic adjunct and that it should be done routinely without special preparation of the patient.

Six case reports are offered from the radiologic point of view which confirmed the fluoroscopic diagnosis of independent collections of free pus in the peritoneal cavity. These required separate incisions in the abdominal wall in 3 cases, one of peritonitis of perforated gastric ulcer and 2 of strangulated inguinal hernia. The diagnosis in these cases as made on clinical grounds, but the immediate drainage of the pus in independent collections of fluid or pus averted long and disappointing convalescence.

Routine fluoroscopic examination is advised in abdominal conditions, gas is much more pertinent result in cases with copious intra-abdominal hemorrhage. Both were cases of ruptured spleen with a large amount of free blood in the abdominal cavity in the first of which early diagnosis was made possible principally by fluoroscopy. In patient who had had high gastric resection and who had elevated temperature 11th postoperative day there was some doubt as to whether the febrile reaction was due to the lung and pleura or to some peritoneal condition. Fluoroscopy revealed collection of fluid beneath the mesocolon. (Abstr. VANANCIAN, M.D.)

Pecoran, A., and Baccaglioni, G.: The Blood Picture in Hemoperitoneum (Sul comportamento della curva ematologica nell'emoperitoneo). *Arch. Ital. di Med.* 94: 353.

The authors summarize data collected by various investigators of hemoperitoneum and report their series of experiments performed upon dogs. The subjects are divided into three groups: the first comprised eight animals in which blood as drawn from the carotid artery in paraffin coated rings and injected immediately into the peritoneal cavity; the second, comprising one animal in which the blood was similarly drawn, but injected subcutaneously; and the last group consisted of one animal, the blood was drawn before but physiological salt solution was injected into the peritoneal cavity. The amount of blood removed varied in the eight of the animal from 50 to 500 cc. In order to avoid the most probable referable to general anesthesia, ethyl chloride was employed locally. Frequent blood counts were made during the first eight days following the procedure.

In addition, data were collected on the clinical course of the condition, temperature, fluid balance

and uric acid of the blood. In the first group the erythrocyte and hemoglobin values were found to decrease thirty minutes after the operation, and to increase in from three to six hours to values almost approximating the original. This increase, which reached its apex in from twelve to twenty-four hours, was then followed by an erythropenia which lasted for four days or more, the counts then gradually rising to normal. Coincidental with the increase in red cells an increase in fragility was observed which disappeared with the onset of anemia. In the second and third groups, on the contrary, the erythrocyte and hemoglobin values were found to diminish immediately upon operation, the decrease lasting for from thirty-six to forty-eight hours, after which a gradual return to normal was noted. In these groups no discrepancy of the fragility determinations was noted. In contrast to other investigators, the authors found in all groups a leucopenia at thirty minutes followed by a moderate leucocytosis which reached its peak at twenty-four hours and was succeeded by a gradual return to normal.

The clinical condition of the animals treated with blood in the peritoneal cavity was found to be decidedly worse than that of the control groups, and was characterized by elevation of temperature lasting for several days, with moderate albuminuria and the transient presence of casts. At no time was hemoglobinuria noted. A temporary rise in the uric acid of the blood was uniformly observed, which was corroborated by indications of hepatorenal involvement found when autopsy was performed on the two animals of Group I which died as a result of the procedure.

On the basis of these observations the authors deduce that blood injected in the peritoneal cavity is absorbed whole into the general circulation, that erythrocytes so absorbed are rapidly destroyed, as shown by the reaction of the spleen and the reticulo-endothelial system of the liver, as well as by the preceding period of increased fragility, and that blood poured into the peritoneal cavity has a deleterious effect upon the general condition.

EDITH FARNSWORTH, M. D.

Because of the important relationship between hemorrhage and mortality attention during operation should be directed first to the arrest of bleeding. Time-consuming procedures such as intestinal resection, should be avoided whenever possible. Mechanical devices for anastomosis should rarely if ever be used. Enterostomy is usually ineffectual and has been displaced by better method of preventing or combating ileus. Drains introduced into the peritoneal cavity are usually unnecessary and undesirable but drainage of the abdominal wall should be instituted when hollow viscera have been perforated. Silk or cotton sutures and ligatures are superior to catgut for the repair of hollow viscera and for the closure of the abdominal wall. Irrigation or lavage of the peritoneal cavity is usually futile but it is desirable to suck out or pick out from the peritoneal cavity liquid blood, blood clot, detached particles of viscera, intestinal content, and foreign bodies.

Postoperative attention should include measures to combat any still-existing shock or effects of hemorrhage. The application of heat to the abdomen, the administration of large doses of morphine, the establishment of gastroduodenal suction drainage, the avoidance of emesis and flatus, and the infusion of glucose and lactated Ringer solution are effective measures in preventing or reducing the severity of ileus and peritonitis. The Miller Abbott tube as well as oxygen therapy may be employed to advantage in selected cases. Biological preparations such as coli-bacteragen, and chemotherapeutic agents such as sulfanilamide and sulfapyridine may prove of value in reducing the mortality from peritonitis resulting from penetrating wounds of the abdomen. Desoxycorticosterone acetate, or other preparations containing the adrenal-cortex hormone may benefit those cases in which peritonitis is unquarantined or already exists. Vitamins should be administered parenterally or orally to favor wound healing and to compensate for the general vitamin deficiency which is likely to develop during the postoperative period. Lymphoid serum or whole blood transfusions are sometimes necessary for the maintenance of plasma protein at normal level during the post-operative period.

Atelectasis and pneumonia frequently complicate penetrating wounds of the abdomen and view of this fact it is important that measures be taken to prevent or promptly treat these pulmonary complications.

The mortality of penetrating wounds of the abdomen is, undoubtedly, continuing to be disappointingly high. In the present series the mortality in the stab-wound cases was 7 per cent, the mortality in the gun-shot wound cases 40 per cent and the combined mortality 37 per cent. However recent advances in the treatment of back hemorrhage, ileus, and peritonitis, which so important in the management of penetrating wounds of the abdomen, are encouraging.

SURGEON J. KERRY, M.D.

Comessato, A., David, N. and Stannero, C.: Radiology in Free Intraperitoneal Fluid (Les images radiologiques de liquide libre intrapéritonéal). *Presse Méd.* Par. 940, 45, 30.

Although much has been written on the value of fluoroscopy in the diagnosis of intestinal obstruction and perforation of the hollow viscera, little has been said about its value in the diagnosis of the amount and position of free intraperitoneal fluid. The author believes that this is a very useful diagnostic adjunct and that it should be done routinely and without special preparation of the patient.

41 case reports are offered from the radiologic point of view which confirmed the fluoroscopic diagnosis of independent collections of free pus in the peritoneal cavity. These required separate incisions in the abdominal wall. 3 cases were of appendicitis, 2 of perforated gastric ulcer and 1 of strangulated inguinal hernia. The diagnosis in these cases was made on clinical grounds but the immediate drainage of the independent collections of fluid or pus averted long and disappointing convalescence.

Routine fluoroscopic examination in acute abdominal conditions gave much more pertinent results in cases with copious intra-abdominal hemorrhage. Both were cases of ruptured spleen with large amount of free blood in the abdominal cavity. In the first of which early diagnosis made possible principally by fluoroscopy. In patient who had had high gastric resection and who had elevated temperature with pleurisy on the sixth postoperative day there is some doubt whether the febrile reaction was due to the lung and pleura or to some peritoneal condition. Fluoroscopy revealed collection of fluid beneath the mesocolon. (Abstract from *Ann. Surg.* 1940, 51, 11).

Pearson, A., and Baccaglini, L. G.: The Blood Picture in Hemoperitoneum (Sul comportamento della curva ematologica nell'emoperitoneo). *Arch. Ital. di Med.* 940, 58, 36.

The authors summarize data collected by seven investigators of hemoperitoneum, and contribute series of experiment performed on dogs. The subjects were divided into three groups: the first comprising 8 animals in which blood drained from the carotid artery in paraffin-coated drainage tubes injected immediately into the peritoneal cavity; the second, comprising 8 animals in which the blood similarly drained but injected subcutaneously; the third group consisting of 8 animals in which the blood before being put into the peritoneal cavity was injected into the peritoneal cavity. The amount of blood removed varied in the eight of the animal from 5 to 300 cc. In order to avoid effect possibly referable to general anesthesia, ethyl chloride was employed locally. Frequent blood counts were made during the first eight days following the procedure.

In addition, data were collected on the clinical course of the condition, temperature, fluid balance

and uric acid of the blood. In the first group the erythrocyte and hemoglobin values were found to decrease thirty minutes after the operation, and to increase in from three to six hours to values almost approximating the original. This increase, which reached its apex in from twelve to twenty-four hours, was then followed by an erythropenia which lasted for four days or more, the counts then gradually rising to normal. Coincidental with the increase in red cells an increase in fragility was observed which disappeared with the onset of anemia. In the second and third groups, on the contrary, the erythrocyte and hemoglobin values were found to diminish immediately upon operation, the decrease lasting for from thirty-six to forty-eight hours, after which a gradual return to normal was noted. In these groups no discrepancy of the fragility determinations was noted. In contrast to other investigators, the authors found in all groups a leucopenia at thirty minutes followed by a moderate leucocytosis which reached its peak at twenty-four hours and was succeeded by a gradual return to normal.

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EDITH FARNSWORTH, M.D.

GYNECOLOGY

UTERUS

Durel, P., Ratner, L., and Derofin, A. An Attempt at Anatomoclinical Classification of Cervicitis (Essai de classification anatomoclinique des cervicitis) *Graef. Arch.* 939-40, 40 305

In the classification of chronic cervicitis Durel and his associates consider that the pathological changes are the most important and primary factor. Most of these pathological changes are indicated by the findings on careful examination with the speculum; they can be confirmed by biopsy. By associating these pathological findings with the clinical findings an anatomoclinical classification of cervicitis has been worked out, which the authors present.

A. Cervicitis characterized by lesions of the epithelium. This may take the form of cervical erosion or ulceration, but if the latter the ulceration is small and superficial. Cervical erosion results primarily from obstetrical tears of the cervix; it is of traumatic rather than of infectious origin, but is usually complicated by infection. This type of epithelial lesion is often associated with glandular lesions (Class D).

B. Cervicitis characterized by loss of epithelium. This may take the form of cervical erosion or ulceration, but if the latter the ulceration is small and superficial. Cervical erosion results primarily from obstetrical tears of the cervix; it is of traumatic rather than of infectious origin, but is usually complicated by infection. This type of epithelial lesion is often associated with glandular lesions (Class D).

C. Cervicitis with lesions of the corium predominating. This group includes several sub-groups: ulcerative nodular cervicitis, presenting an appearance like that of leucoplakia of the previous group with loss of epithelium, associated with numerous nodules; pseudoneoplastic cervicitis in which the nodules are large and bleed easily and in which differentiation from cancer may be difficult even by histological examination; mucous polyps of the cervix; sclerosis of the cervix, hypertrophic or atrophic.

D. Cervicitis with predominance of glandular lesions. This includes the following: hyperplastic nodular glandular cervicitis, often chief endocervical and not infrequently due to gonorrheal infection; cystic glandular cervicitis due to blocking of the orifices of the infected glands by sclerosis; hyperplastic glandular cervicitis sometimes described as adenoma of the cervix.

E. Leucoplakia and leukoplakia-like lesions of the cervix. True leucoplakia is difficult to distinguish from lesions that resemble it on clinical examination; this can be done only by biopsy.

F. Complex forms of cervicitis in which two or more of the forms described are associated.

These various types of cervicitis may be due to different types of infection, postperital, gonorrheal

and other infections, and they may be complicated by terine or adnexal inflammation, but these are not essential factors in the classification outlined.

ARCH. OF MED.

Arnold, R. E., and Potelkin, J. R. Granuloma inguinale (Granuloma venereum) of the Cervix. *Am. J. Obst. & Gynec.* 940, 34 695.

Thirty-eight cases of granuloma inguinale of the cervix were observed at the Charity Hospital of Louisiana during the ten-year period ending July 1, 1930; 15 of the number being identified within the last 3 years. Four of the patients were white and represent the first instances of this disease to be reported in white women.

The clinical and histopathological features of the lesion are discussed. The diagnosis is dependent upon the demonstration of the pathognomonic cell-containing Donovan bodies, which are most readily identified by the use of fixed biopsy material and the silver impregnation method of Dieterle.

Carcinoma of the cervix is easily confused with cervical granuloma inguinale and 7 of the 38 cases in this series were so diagnosed. The clinical similarity of the two conditions is responsible for the error.

Vaginal bleeding and pelvic pain were the outstanding symptoms.

Intravaginal antiseptic therapy is the most effective form of treatment, and tartar emetic gives the best results. The duration of treatment is shortened if large growths are completely excised by means of the cautery knife before specific therapy is begun. Recurrences are common.

Granuloma inguinale of the cervix is a clinical entity which demands general recognition and further study. Only by these means will the true incidence be established and improved methods of diagnosis and treatment evolved.

Proc. U. S. C. 11, 11 D

Dessau, P. A Rare Case of Uterine Cancer: Adenocarcinoma of the Cervix Followed After an Interval of Ten Years by a Papilliferous Adenocarcinoma of the Body of the Uterus (Uterus with two rare de cancer uterina: Adenocarcinoma du col uterine et un adenocarcinome papillaire du corps) *Proc. Belg. d'Acad. M.* 1930.

The cancer of the cervix is the most usually present remarkable histological structure. Thus, if the tumor originates in the cervical region as an epidermoid it will manifest in this character even though it would spread into the entire organ. If the tumor originates in any portion of the body of the uterus it will present the same aspect on staining the cervix. It is of origin, i.e. of glandular epithelium. The present

writer therefore believed that it would be of interest to report a case presenting successively two histologically different forms of tumor, the first in the cervix and the second in the body of the uterus.

A woman of forty-four years with a negative family history and suffering from cholelithiasis was admitted to the Anti Cancer Center of Liege in January, 1935, because her previously normal menstrual periods had become profuse for a period of two years, after which she suffered from a slight but continuous discharge. Examination revealed what was taken to be a cancer of the cervix of the second grade according to the Geneva classification. Histological study of a specimen removed from the site of cervical ulceration revealed a structure corresponding to adeno acanthoma. Radium was applied vaginally and in the uterus, and was followed by roentgenotherapy. The patient was carefully followed up and remained in excellent health for two years and one month following the cessation of treatment. At this time examination revealed a micro ulceration of the cervix and a grayish discharge. Simultaneously she developed tuberculosis of the right cervical glands with fistulization. Five months later she suffered an attack of metrorrhagia of two days' duration. Three years after her first admission to the hospital she suffered severe hemorrhages. Histological examination of the biopsy specimens from curettage at this time revealed a papilliferous adeno epithelioma. A total Wertheim hysterectomy was performed with excellent results. The patient was still in good health when seen one and one half years later.

In attempting to explain the origin of cervical adeno acanthoma, it has been suggested that there may be a bicentric cancerization of both the lining epithelium and of the glandular epithelium. Another theory is that of a possible partial mutation of pavement epithelium into prismatic epithelium during the course of cancerization, with metaplasia preceding or following the neoplastic transformation of the mucosa.

The author is of the opinion that the bicentric theory is most applicable to cervical adeno acanthoma. In discussing the possible relationship between the two neoplasms in this case, he presents various theories, the most plausible being that of a certain predisposition to neoplasm on the part of certain organs or organ systems. It was impossible to evaluate the part that might have been enacted by roentgen cancerization, although the latter is very rare in the genital tract.

The author concludes that in the presence of cervico uterine malignancy of even slight extent, histological specimens should be taken from various levels for the determination of the extent of the cancer is of far greater importance than its index of malignancy.

Surgery is the proper treatment. If indicated, radiotherapy should follow and should be given in such a manner as to ensure complete and final atrophy of the entire uterine mucosa. For this

reason the intra uterine application of radium is of importance. It is possible that too weak dosage of radium in the present case may have been responsible for the later development of the adeno epithelioma.

I DITH SCHWARTZ MOORE

Strauss, A. Irradiation of Carcinoma of the Cervix Uteri in Pregnancy. *Am J Roentgenol*, 1940, 43: 552

Most authorities today agree that carcinoma of the cervix is treated in most instances as well by irradiation as by surgery, if not better. The author of the present article analyzes the question whether or not concomitant pregnancy changes this dictum.

The report is based on 280 cases published between 1895 and 1936, inclusive, with the addition of 1 unpublished case treated by Pomeroy and 2 personal cases. The collected data of 90 articles are tabulated according to the name of the authors, year of publication, duration of pregnancy, type of irradiation, methods of operation, and results on mother and child.

The most frequent age incidence is given as the fourth decade (66 per cent), with the oldest person forty-eight years and the youngest twenty-one years of age. Mussey observed carcinoma of the cervix occurring in 1 of every 437 and Hirst in 1 of every 12,383 cases of pregnant women.

Pregnancy does not tend to develop an immunity to carcinoma. Only 10 women were primiparas and 21 were para II, whereas the remaining were from para III to para X, the average for all being 5.4 pregnancies per patient.

It is not altogether certain that the pregnancy hastens the rate of growth of the carcinoma as often assumed. On the other hand, carcinoma has its effect on pregnancy by retarding the development of the child and by acting as a possible source of hemorrhage or infection.

The usual main symptom that will bring the patient to a physician is bleeding from the vagina. The leucorrhea, even after it becomes foul, may last for several months before the patient pays any attention to it.

As to the treatment to be followed, the author recommends the following rules:

1. If the growth is operable and the child inviable, disregard the child and remove all pelvic organs, then administer postoperative irradiation.
2. If the growth is operable and the child viable precede the operation with an abdominal cesarean section.
3. If the growth is inoperable and the child viable perform an abdominal cesarean section and use postoperative irradiation.
4. If the growth is inoperable and the child inviable the choice rests with the family. Preference should be given to thorough irradiation to cause abortion, and then further irradiation as indicated. If pregnancy is in the later months irradiate and perform cesarean section as soon as the child is viable, then irradiate again if necessary.

From a study of the results as a whole, it appears that irradiation, because of the danger to the offspring, cannot be used so thoroughly nor so efficiently as the non-pregnant woman. Nevertheless, it is a valuable adjunct to surgery under any of the four conditions.

T. LECICZKA, M.D.

Mills, H. C., and Waterman, G. W.: A Further Report on the Radium Treatment of Carcinomas of the Cervix Uteri. 125 Additional Cases with Five-Year Follow Up. *Am. J. Roentgenol.*, 1930, 43, 597.

In the October 1937 issue of *Surgery, Gynecology and Obstetrics*, the authors reported a five-year follow-up on 73 cases of cancer of the cervix uteri treated by means of interstitial radium needles. Now they wish to report on an additional 125 cases treated between 1931 and 1933 by the same method. The total figure of 198 represent an absolute value. If 9 cases too advanced to treat as cervical stump cases and 14 cases treated with radium and/or roentgen irradiation elsewhere are deducted, a relative value of 175 cases is obtained. The five-year survival for the absolute cases amounted to 33.1 per cent with the following distribution for the various stages: I (5 cases) 50 per cent, II (97 cases), 34.6 per cent, III (110 cases) 30.9 per cent and IV (86 cases) 16 per cent. The relative survival rate was 36 per cent. Thus it is demonstrated that the method constitutes a lead to uniformly satisfactory results and that the incidence of complications is no higher than is experienced in other forms of radiation for cancer of the cervix.

Briefly the method consists in the interstitial implantation of long platinum filtered radium needles of low intensity into the parametrial and parametrial tissues together with the insertion of stronger radium capsules into the cervical canal. The distribution is such that a dosage of 6,000 mgrm.-hr. in the parametrium and of 3,000 mgrm.-hr. in the cervical canal is obtained. However one application is planned to last for six or seven days, during which time the radium of course, remains undisturbed. It is not believed that the addition of roentgen therapy has materially affected the five year results.

It would seem that the implantation of long radium needles through the vaginal fornices into the parametria in the presence of sphacelating cancer is a disaster either from secondary infection or from fistula formation. However this fear is not borne out by the authors' experience. In the entire series there was mortality of slightly over 1 per cent from sepsis which may be attributed to the method, and the incidence of fistulas was 7.9 per cent. Figure not larger than occurs naturally or by any other method of radium treatment.

T. LECICZKA, M.D.

Mason, J. C. Total Versus Supravaginal Hysterectomy. *Am. J. Surg.* 1940, 49, 55.

Operations on the uterus for benign conditions constitute a large percentage of the major operative

procedures on a gynecological service. The type of operation to be performed in any given case depends not only on the pathological condition, the patient's general marital state, the state of her general health, and to some extent her wishes in the matter, but also on the experience of the surgeon and the result he has obtained with various types of operations of similar cases.

One of the most controversial points among gynecologists is whether to do a total abdominal hysterectomy or supra-pubic incision in the majority of cases in which it is advisable to remove the uterus.

At least part of the reason for this is that the author is satisfied that when a total abdominal hysterectomy is done by the competent surgeon in a large series of cases, the end-results are better: the morbidity is less, and the mortality no greater than when subtotal abdominal hysterectomy is done in a similar series of cases by the same experienced surgeon. The occasional operator or any surgeon who has not taken special pains to become thoroughly familiar with the technique of total abdominal hysterectomy is advised to continue doing the subtotal operation in a large majority of his cases even at the risk of leaving an infected cervix which might require treatment or removal at a later date.

Danger of cancer developing in the cervical stump is not the only reason for its removal, but cancer developing in this site is more frequently reported than formerly. Statistics are very unreliable in such cases. The weight of statistical evidence however is that cancer occurs in probably not more than 1 or 2 per cent of cases in which a subtotal hysterectomy has been performed for benign conditions.

From January 1934 to December 31, 1938 in the author's hysterectomy as performed for benign conditions in 3,499 cases at the St. Vincent Clinic. Among the 776 cases in which total abdominal hysterectomy was performed, or 2 per cent of the patients died among the 766 cases in which subtotal abdominal hysterectomy was performed, 7 or 0.9 per cent of the patients died, and among the 607 cases in which vaginal hysterectomy was performed, 9 or 1.5 per cent of the patients died. During the years 1936, 1937 and 1938 the author performed 734 hysterectomies with 6 deaths, or mortality of .8 per cent. Of these were vaginal hysterectomies with death, a mortality of .5 per cent.

In recent years the author has become more and more convinced that total hysterectomy is advisable in most cases, such that it is necessary to remove the uterus. The reason for this is that the removal of the uterus is of the female body of women who have been delivered of children by the vagina and who are close to or at the menopause. It provides the surgeon with the technique of such an operation and can complete it within an hour. The three most important considerations in low operative mortality are (1) well given anesthesia, (2) adequate exposure and (3) no unnecessary delay in completing the operation.

In recent years the author has adopted the practice of removing the fallopian tubes whenever hys-

terectomy is performed. If a total abdominal hysterectomy is properly performed there is no tendency to prolapse of the vaginal vault or shortening of the vaginal canal. Neglect to repair the perineum often accounts for an unsatisfactory result following abdominal hysterectomy. Morbidity is most frequently due to thrombophlebitis, low grade pelvic peritonitis, and firm adhesions of loops of the small intestine deep in the pelvis.

Operative technique was described in detail.

ADNEXAL AND PERIUTERINE CONDITIONS

Saller, S. Ovarian Dysgerminoma. *Am J Cancer*, 1940, 38, 473.

Five cases of ovarian dysgerminoma are reported in young women between the ages of ten and twenty-one years. Four of the tumors occurred in the right ovary and one in the left. This group represents an incidence of 6.1 per cent among a series of 80 primary malignant ovarian tumors.

The microscopic appearance of these tumors, including the number of mitoses, appears to be an unreliable indicator of growth potentiality. All of the tumors studied were very cellular and showed a striking resemblance to testicular seminomas. One tumor, in a ten year old girl, recurred a year following removal, with extensive pelvic, peritoneal, and probably lung metastases. Death occurred one year and eight months after removal of the primary growth. Three other patients are living and well without evidence of tumor, three, four, and six years after operation. The remaining patient is symptom-free eight months following removal of the tumor. None of these still living received x-ray therapy either before or after operation.

Clinically, the best indication of the degree of malignancy is the amount of infiltration of the tumor capsule at operation or extension into the adjacent lymph nodes. Dissemination of the tumor is usually confined to the peritoneal cavity, following the lymphatic route. Widespread metastases are distinctly uncommon, though discrete liver and kidney lesions have been reported.

One patient had a child born two years prior to removal of the tumor, and had two normal full term pregnancies two and four years, respectively, following the operation.

CHARLES BARON, M.D.

MISCELLANEOUS

Lax, H. Hypomenorrhea (Die zu schwache Regelblutung). *Geburtsh u Frauenheilk*, 1939, 1, 681.

While numerous investigations and discussions are concerned with hypermenorrhea, little attention has been paid to hypomenorrhea. Only the view that hypomenorrhea is the expression of an insufficient ovarian function is widely held. The underlying purpose of the investigation was to determine the causes of hypomenorrhea and, especially, to discover its relationships to ovarian insufficiency. Forty-five women with extreme degrees of hypomenorrhea were

examined, in whom the duration of the menses varied up to thirty-six hours and the degree varied between a brownish flow up to the use of one pad. Neither the determination of the amounts of prolactin excreted in the urine nor the clinical symptomatology revealed any support for the view that ovarian insufficiency was the cause in the cases of hypomenorrhea observed. Accordingly, all the therapeutic endeavors to strengthen the hypomenorrhea with high doses of folliculin or prolactin were fruitless. Just as fruitless was the search for an anatomical cause of the hypomenorrhea. A hypoplasia of the uterus was found only in 5 cases. The histological examination of the mucosa curetted one or two days before the menses showed the picture of a normal secretory phase in 17 cases and an inferior mucosa with a slight glycogen content and slighter secretion in only 3 cases. Since the latter finding is also present in other conditions, it is not characteristic.

The cause of the hypomenorrhea should be sought rather in an abnormal tendency toward contraction of the capillary vessels, which takes effect immediately after the shedding of the mucosa. While neither the morphological blood picture nor the determination of the bleeding and blood coagulation time revealed any peculiarities, the testing of the capillary resistance according to the method of Stephan revealed a negative endothelial symptom on the day before the menses in all of the 10 cases examined. This was in contrast to the symptoms in women with normal degrees of menstruation, in whom a positive result was achieved 8 times in 10 investigations. Therefore, the normal diminution of the capillary resistance previous to menstruation does not occur in the case of hypomenorrhea.

In explanation of the increased capillary contraction one may refer to the increased contracting catabolic albuminous substances produced by the degeneration of the mucosa, to the excess of calcium which acts as a stimulant to the sympathetic system in women with a particularly labile sympathetic system, or to a disturbance of the central sympathetic centers. In relation to the latter, the associated symptoms, which were found strikingly often in cases of hypomenorrhea, deserve consideration: nausea, vertigo, psycholability with occasional depressions, and a distinctly increased blood pressure.

While hormone therapy is bound to lead to failures, occasionally a transient strengthening of the menses, and, especially, an improvement of the general symptoms may be achieved with hydrotherapeutic measures (alternating sitzbaths, and half baths with brush scrubbing). Treatment of the menstrual flow is unnecessary, especially as spontaneous recoveries are frequently observed.

(H. KOLBOW) LOUIS NEUWELT, M.D.

Thévenard, P. Disease of the Vesical Neck in the Female (La maladie du col vésical chez la femme). *J d'urolog méd et chir*, 1939-1940, 48, 296.

The author reports a case of incomplete retention of urine in a woman thirty years of age which was

apparently due to obstruction of the vesical neck which stimulated prostatism in the male. The condition was successfully treated by coagulation.

A brief review of the literature on the subject is presented and attention is directed to the apparent rarity of the condition as only 91 cases have been reported. However the author is of the opinion that the condition occurs more frequently than is commonly realized.

The diagnosis is based upon the history of progressive dysuria, the presence of residual urine, and the endoscopic characteristics, which consist of the presence of pillars and thickness of the sphincter. A discussion of the differential diagnosis is given and the conditions considered include lesions of the spine (tubes, spina bifida, and myelitis), urethral stricture, cystocele and so-called neoplasms.

The treatment consists of resection of the neck either by the transurethral or transperineal route. The author prefers regional anesthesia and the specially constructed loop of Hendrickson to be used with the resectoscope. He believes that it is desirable to remove the tissue circumferentially. The two most important complications are hemorrhage and infection. In an attempt to obviate the latter the pre-operative and postoperative administration of sulfanilamide is suggested. The results of operation have been very good.

The pathogenesis of the condition is discussed. The two most seriously considered theories are inflammatory and muscular hypertrophies of the vesical sphincter. The pros and cons of these theories are briefly reviewed. Another theory is based upon the pathological alterations of a group of glands in the female analogous to the prostate in the male; thus, the condition is considered comparable to prostatic hypertrophy in the female. The author, however, is not in accord with those who have advocated the latter theory.

MICHAEL DEBASTY, M.D.

Puredi, E. A Pathological-Anatomical Review of Tuberculosis of the Female Genitalia. (Rilevi anatomo-patologici sulla tubercolosi del genitali femminile). *Rev. Med. di Genova*, 1910, 3.

There is considerable discrepancy between the clinical and anatomical statistics on tuberculosis of the female genitalia. At Florence Ferrou found the total incidence of genital tuberculosis to be 4.5 per cent, and at operation 1 per cent. Falco of Parma reports an incidence of 5 per cent. Momo of the Cagliari Clinic diagnosed 90 cases of genital tuberculosis in a series of 1,930 patients treated between 1907 and 1917. Of these 66 (3 per cent) were confirmed by histological studies. In Sardinia the highest incidence is reported as 76 per cent by Stolper, and 3 per cent by Foster. Merletti on the basis of anatomical studies reports an incidence of 3.8 per cent among women between the ages of fifteen and forty-five years. In general genital tuberculosis is fourth on the list of incidence pulmonary, digestive, and renal tuberculosis preceding

it. In the author's series of 1,705 uterine genital tuberculosis in women occurred in 3.1 per cent. On the basis of statistical analysis he estimates the total incidence in Italy among all persons to be from 2.1 to 3.5 per cent.

As concern distribution according to age, Festa found 0.8 per cent of 35 infants had genital tuberculosis with a marked tendency to tuberculous peritonitis. Ferrou presented a tabulated list which indicated that the highest incidence of female genital tuberculosis occurs in the age group of twenty-one to thirty years (44 per cent) and the next highest in the group of thirty-one to forty years (32 per cent). In the author's material an incidence of 47.7 per cent as found in the age group of twenty-one to thirty years. In general, genital tuberculosis is most frequent between the ages of twenty and forty years and least frequent before the age of sixteen years.

The cycle of menstruation particularly predisposes the genital organs to tuberculous infection, but the greatest influence is exerted by the reproductive process (pregnancy, parturition, puerperium). The physiological changes of pregnancy favor a genital tuberculous infection. The author presents the anatomical findings in 3 cases to illustrate the effect of the reproductive processes on genital tuberculosis.

Case A. A forty-year-old woman in the puerperium. At autopsy a deforming fibro-adhesive peritonitis (peritonitis peritonealis, peritonitis), with a thick plastic membrane and several serofibrinous nodules were found. The ovaries were reduced to hollow shells containing yellow caseous material, and both ovaries and tubes were covered with fibrous membrane. The abdominal peritoneum (terus) presented tuberculosis of the corpus and of the neck.

Case A. A twenty-six-year-old parthid. During the puerperium of her last pregnancy pains developed in the lower abdomen, with irregular loss of blood and more or less intense fever. Exploratory laparotomy as done at the obstetrical clinic. The patient died several days later (two months after delivery). All the abdominal viscera were matted together. There were numerous caseous masses the size of nut. There was no fluid exudate. The mesenteric lymph nodes were enlarged and caseous. The left ovary was caseous mass. The fimbriae of the uterus was involved in the adhesions and the uterine mucosa appeared caseous.

Case 3. A thirty-one-year-old woman who died two months after an abortion. The right ovary was transformed into a sac containing a yellowish white liquid. The tube on the same side was enlarged and contained the same sort of material as the ovary. The uterus was enlarged and in its cavity were a few c.c.m. of thick yellow fluid. The mucosa and neck of the uterus showed superficial tuberculosis ulcers.

Pregnancy and the puerperium also favor the dissemination of the tuberculous infection throughout the genital tract. Operative trauma predisposes to the development of genital tuberculosis as well as

malformations which cause dystrophy and dysfunction of the genitalia. The author found that 15.2 per cent of his series had uterine hypoplasia. He believes that in most cases genital tuberculosis is of hematogenous origin. In 78 per cent of the cases of genital tuberculosis a pulmonary tuberculosis was also found. Peritoneal tuberculosis is secondary to the development of genital tuberculosis. As to the differential incidence in the genital apparatus the author presents the following data: ovaries, 43.4 per cent, tubes, 76 per cent, uterus, 56.5 per cent, and vagina, 13 per cent. Tuberculosis of the tubes is the most frequent manifestation of genital tuberculosis. Tuberculosis of the vagina and the vulva are most rare. The author encountered tuberculous ulcerations of the posterior fornix of the vagina.

JACOB E. KLEIN, M.D.

Huet, J. A., Comte R. J., and Herschberg, A. D.
Diethylstilbestrol, A Synthetic Estrogenic Substance (Le 4-4, dihydroxy α β diéthyl stilbène [Diéthylstilboestrol] Substance oestrogène synthétique) *Gynécologie*, 1939, 38, 517.

The recent work of Dodds and his coworkers on the synthesis of stilbestrol again attracts attention to the follicular hormone. This product, chemically different from folliculin, possesses all its properties, and in addition may be administered by mouth and is more economical. The author reviews the history of the drug and notes that in 1936 Dodds demonstrated active estrogenic properties in 4-4 dihydrodiphenyl. The author then describes the chemical characteristics of diethylstilbene.

Experiments on the ovariectomized rat show that the subcutaneous administration of 0.3 gr. induces estrus in from three to five days. It also causes a progressive hypertrophy of the uterus, which depends on the dosage. Thus, 1 gamma causes hypertrophy of the myometrium, 50 gamma also cause endometrial hypertrophy, 200 gamma cause a massive endometrial hypertrophy with hypersecretion. On castrated rats it induces mature reactions in the vaginal mucosa. Like folliculin it depresses the action of the ovaries. Like estrone, it sensitizes the endometrium to the action of progesterone. It stimulates the development of the mammary glands in immature animals. Embryological experiments indicate that it has a feminizing influence, in these experiments from 82 to 84 per cent of the offspring were females and from 16 to 18 per cent were intersexual, there were no males. This substance inhibits the action of the androgenic hormones and all of its effects are rendered reversible by progesterone. Other pharmacological effects of the drug are: diminution of the oxygen consumption, delay of increase in weight, inhibition of the anterior hypophysis, lowering of the arterial tension, dilatation of the capillaries, and inhibition of uterine and intestinal peristalsis. The drug seems to have an affinity for the sympathetic system.

Toxicity experiments indicate that from 30 to 50 mgm. per kilo given intravenously cause the

death of a rabbit in convulsions within from one to two minutes. This corresponds to 1 gm. of the drug used clinically. In dogs the drug causes an anemia. However, such massive doses are never used clinically. It has a carcinogenic action, but to a less degree than estrone.

In 1938 Guldberg first used the drug clinically, a castrated woman had a menstrual cycle after the administration of 20 mgm., followed by 30 mgm. of progesterone. In gynecology it has been used in amenorrhea, oligomenorrhea, dysmenorrhea, genitomammary hypoplasia, and in the menopause. The author presents a series of 46 brief clinical reports on the treatment of these conditions under his own observation. He concludes that the major indication for this drug is dysmenorrhea and oligorrhea. It has an ameliorating influence on certain menopausal manifestations. Intolerance to the drug is indicated by nausea, vomiting, and diarrhea, these symptoms cease when the drug is discontinued. The standard dose is 2 mgm. per day in 2 doses, taken after meals for from eight to eighteen days. To inhibit the hypophysis 3 mgm. are given for about four days.

The author concludes that in his series of cases the best effects were noted in infantilism of the genital tract, dysmenorrhea, oligomenorrhea, in the menopause, and in pituitary-ovarian imbalance. He obtained success in 77 per cent of his patients with menstrual dysfunction, and in 82 per cent with menopausal disturbances. Benign symptoms of intolerance were noted in 10 per cent of those taking the drug, and serious symptoms in 3 per cent of the patients. To avoid disappointments in its use, the drug should be given only after precise clinical and etiological diagnosis. The author presents a complete bibliography on the subject.

JACOB E. KLEIN, M.D.

Bishop, P. M. F., and Others. **Estrogenic Properties of Stilbestrol Dipropionate and Hexestrol** *Lancet*, 1940, 238, 629.

Bishop reports the effects of the administration of stilbestrol dipropionate and hexestrol in certain gynecological conditions. The former drug is an ester of stilbestrol, synthetically prepared, with a prolonged activity. Hexestrol is a highly active polymer of anol, a hydrogenated form of stilbestrol in which the double bond has been removed between the two carbon atoms. The two drugs were given, alone or in combination, to three general groups of cases. The first group was comprised of menopausal patients with both subjective complaints and objective difficulties such as an atrophic condition of the vagina. Relief was obtained in 91.2 per cent of 103 cases. Twenty-seven per cent of the hexestrol cases did not respond, probably because of the low dosage given. The second group consisted of 48 patients with amenorrhea. Drug administration produced "uterine hemorrhage" in 28 of these cases. The types of amenorrhea were not differentiated. A third group, consisting of a

small series of cases of dysmenorrhea and cases in which inhibition of lactation was required, showed poor results in dysmenorrhea and uniformly successful results in regard to the inhibition of the lactation.

Toxic symptoms, such as nausea, vomiting, and occasional jaundice, were observed in 13 per cent of the total cases. Bishop states that the toxicity of stilbestrol is about five times as great as that of hexoestrol and roughly the same as that of stilbestrol. No serious associated effects were recorded. The average single dose associated with toxic symptoms was 3 mgm. as compared with the average single dose of 1.5 mgm. after which toxic symptoms did not appear. The average total dosage free of toxic symptoms was 96.5 mgm. as compared with 39 mgm. total dosage which was productive of toxic symptoms. A personal idiosyncrasy to stilbestrol may exist. The toxic drugs discussed Bishop ascribes estrogenic properties which are similar to those of stilbestrol.

WILLARD G. FRENCH, M.D.

Bennicandro, G. The Action of Synthetic Testosterone on the Vaginal Epithelium of Castrated Women (L'azione del testosterone sintetic sull'epitelio vaginale delle donne castrate). *Atti del Soc. Ital. di Ost. Ginec.* 94, 35-41.

The author continues his studies on the action of various hormones on the vaginal mucosa, and reports 4 cases of isophorectomized ovariectomized women whom he treated with testosterone propionate. Two of the subjects had been operated upon several months previously, the third one year before the fourth many years ago.

The procedure consisted of gynecological examination and biopsy followed by the parenteral administration of from 100 to 200 mgm. of testosterone given in doses of 50 mgm. over a period of fifteen days. At the conclusion of therapy second biopsies were taken and the results were compared.

In general, all cases showed the characteristics of atrophy on the first examination; the epithelial strata were reduced in number and the cells were diminished in volume and glycogen content. In 4 of the 4 cases under observation there had been evidence of inflammation with redness and leukorrhea. In these there was prompt remission after therapy. All 4 subjects demonstrated profound modifications consisting of increase in the number of epithelial strata, in the volume of the individual cells, and in the glycogen content.

The interpretation of this follicular-like action is difficult. The testosterone may act directly upon the vaginal mucosa or indirectly by means of some other endocrine gland, presumably the pituitary or thyroid, being converted into the structurally similar follicular. Whatever the mechanism of action is, the author believes that there are definite indications for its use chiefly when the presence or possibility of cancer makes the administration of follicular inadvisable.

FERNANDO M. M. M.

Roberts, E. Radiology in Feminine Sterility (La radiologia nella sterilità femminile). *Ginec. ginec.* 94, 6.

The author evaluates the role of radiology in the study of sterility in the female first in diagnosis and second in therapy. Although infrequently indicated and technically difficult, pneumoperitoneum may offer information which in some cases cannot be obtained by other means. The original discovery by Wint and Wyroff it has proved useful in the determination of the degree of fixation of uterine displacements, and in differentiation of tumor and congenital anomalies of the genitalia, ovaries, tumors and alterations in the tubes all of which may occur. The cause of sterility. This method may even be combined with hysterosalpingography.

High, by the introduction of gas or a opaque medium in the genital tract provides a picture of the internal contours. Colpography also has been of assistance in determining the presence and character of malformation of the vagina. Hysterosalpingography merits special emphasis, the simplest and most effective method of localization. First used by Cary in 1914 it was not until the discovery of lipiodol for this purpose in 1915 that the procedure became safe enough to be incorporated in the ordinary armamentarium of clinical practice.

Various techniques have been employed the first, with the syringe accurately placed in the cervical canal so that the opaque material can be injected at high pressure without escape of the second, with the canal open the material being dropped without pressure into the uterus the third, again low-pressure method, by which definite quantity (1 or 2 cc.) is injected under fixed pressure (not greater than 60 mm. of mercury). It should be borne in mind, the reference to the tubes that although 60 per cent of the cases of sterility the uterus has undergone more or less profound changes it should be noted that there are other important considerations. The examination must be made in the first fifteen days of the menstrual cycle because of the hyperplasia of the endometrium which occurs in the latter half of the cycle and tends to dilate the internal portion of the tubes. The technique of the procedure must be perfect. Initially tubes not filled must be unilaterally unimportant if the iodized oil is permeated the tubes pressure alone will not fill the uterus. It is an absolute rule. Among the possible causes of sterility from the point of view of hysterosalpingography are inflammatory conditions arising in the tubes or mainly from recognized peritonitis and infection, peritoneal reaction, presence of the lipiodol in the blood vessel and finally traumatic perforation of the uterus. Endometritis and metrorrhagia and pregnancy.

With regard to the application of radiology much less gratifying results have been obtained. It is much more than 20 per cent. If the tubes are occluded the incidence of cure is not better than 5 per cent. When the tubes are open and there is no evidence of

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small blood clot, or slight adhesions. If patent, salpingography tends to favor conception. It is also probable that extra-uterine pregnancy is so favored. Employed on the endocrine system, radiology is said by Baer and Mazer to offer promising results in the treatment of menstrual disturbances. By modifying the dose, roentgentherapy can be used to excite or depress the involved structures. This type of therapy, however, has lagged far behind the hormonal approach, and the mode of action on the maturing follicle directly by the rays or indirectly by the pelvic hyperemia is far from certain. Equally dubious is the action of irradiation on the gonads through stimulation of the thyroid and the pituitary glands. The author contributes in this connection a series of cases, 34 in number, in which the patients complained of menstrual deficiency, and were treated by irradiation of the ovaries and in some cases irradiation of the pituitary gland. Improvement was noted in a fair percentage of cases, but the improvement tended to be of short duration. Of the 34 patients treated, 21 were married and 16 of these have been carefully followed. Of the latter,

4 became pregnant after an interval varying from eight months to two years. The single contraindication to ovarian irradiation with small doses is conceded to be the presence of infection.

The apparatus employed was of the Duval type, and the factors were tension 170 kv, intensity 3 ma, filter 0.5 mm of copper plus 3 mm of aluminum, half-value layer of copper 0.8 mm, distance 40 cm with a circular field of 13 cm diameter over the ovaries. From 125 to 150 roentgens were given in two treatments at an interval of one week. Irradiation of the thyroid has proven more successful in diminishing the duration of the menses in the hyperthyroid than in the converse condition. The thymus gland has also been studied as to its radiosensitivity. In this connection, a group of cases characterized by hypoplasia of the genitalia with retarded pubescence adenoids, congenital splenomegaly, retarded dentition, hypoglycemia, hypertension, epistaxis, lymphocytosis, monocytosis, and depressed basal metabolic rate—the so called hyperthymic syndrome of Pender—have been definitely improved by irradiation. EDITH FARNSWORTH, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Merlino, A. Primary Cervical Pregnancy (Gravida 1, placenta cervicale primitiva) Arch. d'obstet. gynec. 1940 4 42.

Since cervical pregnancy is the consequence of extracorporeal development of the ovum it is a variety of ectopic pregnancy. It is the rarest form, in the entire literature there are only 33 cases recorded. The author reviews the literature from Chavanne (1861) to Schuerger (1937).

The author reports the case of a patient, thirty-three year-old housewife, who was in her first pregnancy. Her previous history had been uneventful. Menstruation began at thirteen years. Her menstruations had been irregular and of four or five days duration. Early in pregnancy she had the usual mild disturbances. However, before term she began to complain of pains in the sacro-lumbar region and began to pass blood profusely from the cervix. General physical examination was negative except for a marked anemia. The Wassermann test was negative. The uterus was hard and did not react after prolonged massage. Palpation indicated that the fetal parts were in direct contact with the abdominal wall. The vertex was down in the pelvis and the breech was higher up. The small parts were felt anteriorly and to the left. At the exit of the cervix a voluminous sac was felt which distended the upper



Fig. Another view of specimen removed.



Fig. Specimen removed by hysterectomy.

third of the vagina. The softened terine orifice as dilated to an extent of 5 cm. The vertex presented into the cervix. The placenta was found adherent to the posterior wall of the cervix. The bony pelvis was normal in every respect. A diagnosis of placenta previa diffusa was made. Because of the condition of the patient and the position of the placenta a laparotomy was decided upon as the procedure of choice. At operation it was found that the amniotic sac was attached to the cervical canal, which the ovum was implanted. A hysterectomy was done. The patient made an eventful recovery in five weeks (Figs. 1 and 2).

The corpus uteri was four times the normal size. The terine mucosa was markedly hypertrophied and the terine cavity was absolutely empty and free from an ovular element. The uterus fixed in formalin had the following measurements: thickness of the anterior wall 3 cm, thickness of the posterior wall 3.5 cm, thickness of the fundus 10 cm, thickness of the decidua on the anterior and posterior walls 1 cm, length of the terine cavity 6 cm, width 3 cm. At the level of the terine orifice the corpus terminated in a continuous sac 6 cm long which stopped above at the closed internal orifice and below at the external orifice. The diameter of the external orifice was 4 or 5 cm. This sac which contained the ovum, was of the greatest amplitude at the middle of the cervical canal, and measured 4 cm in

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transverse diameter and 8 cm in its anteroposterior diameter. The placenta occupied the upper fourth-fifths of the posterior wall and spread over the entire internal uterine orifice. The cord was inserted laterally and to the right. The placenta was adherent to the cervical tissues and it was impossible to separate it from the cervix. It had the appearance of a diffuse placenta which had formed a most intimate union with the cervical myometrium. The external orifice of the cervix was regular and free from chorionic attachments. The tubes and ovaries were normal. The right ovary contained the corpus luteum of pregnancy. Microphotographs are presented in the original of the various tissues involved.

None of the reported case attained full term, most of the patients aborted at 1, 2 or three months, exceptionally at five or six months. There is not any characteristic symptomatology of the condition. Early it may be confused with abortion. Later it is confused with placenta previa. Hemorrhage is the outstanding symptom. On pelvic examination the corpus uteri may be confused with a fibroid. The excessive length of the cervical canal may have been a contributing factor in the author's case. Prognosis is reserved since death is possible from hemorrhage. Therapy is directed at the prevention of this occurrence usually by a hysterectomy.

JACOB L. KELL, M.D.

Frühinsholz, A. and Richon J. New Findings Regarding True Prolonged Pregnancy and Its Significance (Nouvelles données sur la gestation prolongée vraie et sa signification). *Gazette des hôpitaux*, 1930, 19-20, 25-27.

Frühinsholz and Richon define as true prolonged pregnancy a delay in delivery until more than 300 days after the beginning of the last menstruation in women who have menstruated regularly every 15 to 25 days eight to thirty days after the last delivery occurs in the eleventh month after the menstrual period, i.e. in the tenth month after the pregnancy has become evident by the cessation of menstruation. They have excluded from their series of prolonged pregnancies those in which delivery occurs from 300 to 309 days after the beginning of the last menstrual period, although this group might include some cases of true prolonged pregnancy.

In 1930, the authors reported a series of cases of true prolonged pregnancy, and since that time they have recorded 178 new cases (171 in pregnancy in a series of 10,893 deliveries, i.e. 0.65 per cent). The duration of the pregnancy as calculated from the beginning of the last menstrual period varied from 301 to 351 days in 92 cases; the duration of the pregnancy from 301 to 314 days after the last menstrual date which represents a minimum duration of the pregnancy (from the time of impregnation clinically proved or of presumed nidation) of from 70 to 281 days. In the case in which pregnancy was most markedly prolonged (351 days after the last menstrual date), there was definite clinical evidence of syphilis and the Wassermann reaction was positive,

in a number of other cases syphilis could be suspected clinically. In only 17 of the 178 cases in this series could the mother be considered entirely normal, there were an unusual percentage showing congenital stigmata, and others with evidence of puerperal and ovarian deficiency. In most cases the establishment of menstruation was delayed and the history of the primiparas in the group showed that pregnancy had not occurred until some time after marriage in most cases.

The average duration of labor in this group was longer than normal, and more operative deliveries were necessary. The average size of the infant was greater than normal in this series, but the prolongation of labor and the necessity for operative delivery did not seem to be due to the large size of the child as much as to the uterine distention. The weight of the placenta was more than 600 gm. in 55 of the 178 cases. The fetal mortality was 13 deaths (more than 10 per cent) and 7 incarcerated fetuses were included. This is an unusually high fetal mortality higher than in the authors' previous series of prolonged pregnancy in which the fetal mortality was 7 per cent. Most of the infants were normal in appearance at birth but one died of intestinal malformation, and another of mechanical asphyxia shortly after birth.

From their study of these 178 cases of cases of prolonged pregnancy the authors conclude that the induction of labor is not justified merely because the pregnancy is prolonged. In some cases when the induction of labor is justified as for example when the patient has had a previous prolonged pregnancy with death of the infant. Most of the fetus dies *in utero* the woman should be promptly delivered. After M. Mirvis.

Burger, K. The Intra-Uterine Death of the Product of Conception During Pregnancy (La morte intrauterina del prodotto del concepimento in gravidanza). *Archiv di ostet e ginec.*, 1930, 4, 1.

The author presents a review of intra uterine death with an extensive bibliography. During the period from 1931 to 1932 there were 6,000 fetuses which died during pregnancy among 220,000 births in Hungary. Fetal mortality is of great significance not only from a statistical but also from a national standpoint. Infectious diseases of the mother may cause death of the fetus during pregnancy. Tuberculosis and lues are the most important in this respect. Among the tuberculous gravidas 11 per cent abort and 11 per cent have premature labor. As in all infectious diseases including lues, death of the fetus is caused by transmission of the disease through the placenta, or by changes induced in the placenta by its infection. Lues causes intra uterine death in 30 per cent of the fetuses. In organic heart disease 30 per cent of the pregnancies terminate in abortion, premature labor or intra uterine death of the fetus. Anomalies of maternal genital development tend to cause premature interruption of pregnancy rather than fetal death. Anemia during pregnancy may cause a 35 per cent fetal mortality. In hemorrhagic diathesis the fetal mortality is from 50 to 60 per cent.

cent. Chronic nephritis and nephropathies cause 70 per cent fetal mortality according to Ziegler. Hypertension is associated with a 3 to 3 per cent fetal mortality which depends on the severity of the hypertension. The thoracic clinic Bureau reported a 4.5 per cent fetal mortality due to maternal hypertension after five years of the problem. However in many cases, chronic nephritis is difficult to differentiate from toxemia of pregnancy. In 120 cases of toxemia of pregnancy Martinotti reported fetal mortality of 42 per cent in eclampsia 47 per cent. According to Stuart, toxemia is the chief cause of intra-uterine death of the fetus. Kellogg reported 26 per cent fetal mortality in pre-eclamptic toxemia.

However, in many cases the cause of fetal mortality is unknown. Thus, Sellers could establish no cause for fetal death in 183 of 2070 cases. Mitchell could not demonstrate the cause of fetal death in 20.9 per cent. Gillespie could not find the cause of death in 5.9 per cent of macerated fetuses. Thus it is apparent that in many cases the cause of fetal mortality is enigmatic.

The endocrines exert an influence on the fetus. In diabetes it was found that the fetus was usually overdeveloped, presumably because of the maternal hyperglycemia. The literature indicates that from 33 to 75 per cent of such fetuses die during pregnancy. The insulin therapy has not improved these results very much. The thyroid also exerts a marked influence. In hyperthyroidism there is a tendency to abort.

The ovarian hormones exert profound influence during pregnancy. Zondek obtained good results in habitual abortion by the use of follicular hormone. Experiments indicate that follicular hormone stimulates the uterine musculature, the action of the hormone of the posterior lobe of the hypophysis. The administration of large amounts of gonadotropic hormone has a harmful effect on the fetus during pregnancy.

The maternal nutrition also has an effect on the fetus. The vitamins are important. Deficiency of E and Vitamin A and of Vitamin B₁ C and D has an influence on the fetus. Maxwell and Preston note that intra-uterine death of the fetus may be induced by Vitamin C deficiency. The importance of this vitamin during pregnancy is indicated by the fact that normally the placenta is a source for the deposition of Vitamin C. Vitamin E has an unquestionable influence on the genital organs, and its deficiency leads to abortion. Other elements of nutrition such as protein, mineral, especially iodine, also have an important influence on the fetus during pregnancy.

Another factor to be considered is the intra-uterine death of the fetus in the male germinal cell. Veterinary medicine Hammond points out that cause of trophic of the fetal calf is immaturity of the spermatozoa of the bull. Hypo-ovulation may also cause damage to the germinal element. Mosch has pointed out the importance of quality

in the spermatozoa, and has found anomalies such as according to 20 per cent, may cause sterility. However Mosch thinks that if conception occurs the defect in the male element may have a moderate effect on the development and normality of the product of conception. It may be of importance even in the intra-uterine death of the fetus.

The germinal injuries from roentgen rays also have an important place in the literature. Germinal lesions of the ovum cause its death before implantation. Other forms of life so-called lethal gene has been described which causes the death of the developing individual. The role of such a gene in the human being is yet unknown. It is surmised that the X-chromosome may be the carrier of recessive lethal and sublethal genes.

Abnormal prolongation of the duration of pregnancy may also lead to death of the fetus. Engle has shown that in such cases there are regressive alterations in the placenta. Opinions are divided that there is primary death of the fetus. I believe that the cause is usually to be found in the placenta. From experiments he has decided that these changes are usually hemorrhage, infarction or necrosis. Palk has shown correlation between follicular hormone and Vitamin C. The former increases the end of pregnancy with isolated deficiency of Vitamin C, the latter deficiency causes the death of the fetus in prolonged pregnancies.

Conditions affecting the placenta and the cord also may cause the death of the fetus. Such happen as placental infarct, calcification anomalies of the cord, such as one umbilical artery and anomalies of the amniotic membranes and fluid (hydramnios) may cause death of the fetus.

The signs of intra-uterine death of the fetus are discussed. The Achern-Zondek test the examination of fetal heart tones and movements, on examination, the shrinking in size of the fetus and the increased coagulation of the maternal blood are factors which aid in the diagnosis. Intra-uterine death of the fetus is of no particular danger to the mother. Spontaneous delivery usually occurs within four weeks in 95 per cent of the cases.

In conclusion, the author notes that many causes of intra-uterine death of the fetus are still unknown. In order to decrease these deaths it is necessary to have precise understanding of these causes. The influence of modern knowledge of diet and vitamin is emphasized. Likewise, the importance of regular medical and obstetrical examinations is stressed for the same purpose the general obstetrical knowledge of physicians. It has to be improved, as well as the social condition of pregnant women. The latter is a social problem which medical science

James L. K. M.D.

Verhage	Leterus in	Pregnancy	(11 cases)	det
sch. abnormal				of
93%	3%			
	concrete	the	in	used
	glands	gave	establish	model

Simple drainage is usually successful in the treatment. It is thought that these cases are more frequent than the report indicates. Locoma of them may be masked under the diagnosis of appendicitis.

In the pathogenesis of this condition there are two important factors: the weakening of the peritoneal reactivity prior to pregnancy and the infectious role of colon bacilli during pregnancy. The author discusses these two factors in great detail with appropriate explanations from the literature. The diagnosis is usually made by operation or a tap. Since there is no typical clinical syndrome. The prognosis is favorable in all the cases treated surgically; 3 patients treated surgically lived and 4 untreated patients died.

The author favors drainage in the right iliac region and continuous morphine administration to prevent premature delivery is advised. If possible cesarean section is done in time, preferably through the previous scar incision, followed by hysterectomy.

A bibliography of the entire subject is presented.
Jaco F. Kuerst, M.D.

PUERPERIUM AND ITS COMPLICATIONS

Butler H. M. and Hill A. M. Hemolytic Streptococcal Infections Following Childbirth and Abortion. I. Determination of the Virulence of Group A Strains. II. Clinical Features with Special Reference to Infections Due to Streptococci of Groups Other Than A. *Vol. J Austral Med.* 1933, 293.

Lancefield precipitin test enables one to distinguish that group of hemolytic streptococci most dangerous to man but there is still lacking a simple method of determining the degree of virulence of individual Group A strains. In puerperal and abortion infections, Lancefield and Hare maintained that Group A streptococci if present in the vagina postpartum, almost always gave rise to serious puerperal infection. The authors experience at the Women's Hospital, Melbourne, during the last two years has shown that of the women who yielded pure or almost pure culture of streptococcus hemolyticus Group A from the vaginal swabbing, more than half showed the symptoms of only mild infection.

The failure of these results fully to confirm Lancefield and Hare's statement is most readily explained on the assumption that different Group A strains vary considerably in their ability to produce severe human disease.

In this paper the authors attempt to derive a simple means whereby the likely course of Group A puerperal infection could be determined in the initial stage of the illness.

The work of Hare suggests the probability that the virulence of the infecting strain is the important factor with regard to the severity of these infections. It seemed possible therefore that a study of the characteristic of Group A strains might reveal a correlation between the severity of the infection and the nature of the infecting strain.

The study of Group A strains causing puerperal or abortion infection has shown that the series it was possible to establish a relationship between certain properties of the strains and the severity of the infection.

The demonstration of capsules in young cultures established a reliable correlation between the severity of infection and the nature of the infecting strain.

In general the capsulated strains gave rise to severe invasive infections, but the non-capsulated varieties were associated with the mild cases. The correlation was in agreement with the ability of the strains to resist phagocytosis in freshly defibrinated human blood. The capsulated organisms were usually resistant to phagocytosis and were able to multiply in such blood, whereas the non-capsulated strains were readily taken up by the leucocytes.

The colony form on surface plates and in slippy serum, and the type of growth in serum broth also served to distinguish strains from severe cases from strains causing mild infection. However, the correlation was not so good that resulting from the demonstration of capsules.

Tricarbolic activity and hemolysis production did not prove of value in distinguishing the strains from the various types of cases. Griffith typing was of only limited value because of the many strains which fell outside of the established types.

The results obtained show that in this series the capsulated strains were possessed of far greater capacity to invade the tissues and to set up an acute generalized infection than were the non-capsulated organisms. This is well shown by the strains from blood cultures. Of each strain, 4 are capsulated in young cultures.

This finding agrees with the observation of Dwyer and Olszewski (1933) that acute and fulminating infections are due to capsulated strains.

In regard to capsulated strains having greater degree of infectivity, they have not obtained evidence of this in puerperal infections.

The authors believe that the examination of Group A strains for the presence of capsules in young cultures, either alone or in conjunction with observation on resistance to phagocytosis and colony form, should usually enable one to predict the probable severity of puerperal infection within twenty-four hours of the isolation of the strain from the vaginal swab. If the demonstration of capsules alone is relied upon, reports can often be made within six or seven hours of detection of the growth of Group A strains. In many instances it has been possible to determine the group and the presence or absence of capsules within twenty-four hours after taking the vaginal swab.

The second part of the report deals with series of hemolytic streptococcal infection following childbirth and abortion in which infection due to streptococci of groups other than A assumed considerable importance and in which in addition the majority of the women infected with Group A strains were not seriously ill.

Since June, 1937, at the Women's Hospital, Melbourne, vaginal cultures have been made as a routine measure from patients in the puerperium and after abortion when the temperature rose to 101° F. To the end of January, 1939, 864 such cases were investigated, and in 108 of these hemolytic streptococci were grown from the vaginal swab. During this period there also occurred a fatal puerperal infection due to a hemolytic streptococcus, in which the infecting organism was not detected in the vaginal cultures, and 1 case of peritonitis after abortion in which cultures from the vagina were not made. This paper deals with these 110 cases.

The hemolytic streptococci isolated from these cases were grouped according to Fuller's modification of Lancefield's precipitin test. Eighty-two patients were infected with Group A strains, 12 with Group B, 10 with Group C, and 6 with Group G.

While Group A streptococci were, as was to be expected, the predominant infecting organisms in this series of 110 consecutive cases of hemolytic streptococcal infection, they were not of exclusive importance. Streptococci belonging to Groups B, C, and G were responsible for 25 per cent of the cases.

The outstanding feature of the 82 infections due to streptococcus hemolyticus Group A was the high

proportion of mild cases (70 per cent). In the authors' experience the mere identification of streptococci from the vaginal swab as belonging to Group A is not sufficient evidence on which to base the prognosis. The correlation observed by the authors between severity of infection and encapsulation, and to a less extent certain cultural characteristics of the infecting strain, has been recorded.

Of the infections due to streptococci not of Group A, those due to Group B streptococci were the most numerous and the most serious. Among the 12 women infected with Group B strains there were 4 deaths, 3 due essentially to the infecting streptococcus. In 2 of these cases the cause of death was acute infective endocarditis.

The 10 Group C infections were for the most part mild. That Group C streptococci can cause a severe infection, however, is evident from a case seen prior to this series and described by the authors.

There were 6 Group G infections, all mild. The only known serious Group G infection among the records of this hospital was 1 of septic abortion already reported by Macdonald (1939).

The mild infections due to streptococci of Groups B, C, and G did not differ clinically from mild infections due to streptococcus hemolyticus Group A.

DANIEL G. MORTON, M.D.

GENITO-URINARY SURGERY

ADRENAL, KIDNEY AND URETER

Caminetti, S. The Descending Pyelogram in Renal Exclusion (La pyclografia discendente nel renal escluso) *Arch Ital d Urol* 930 57 3

An inquiry is made into the relationship of complete renal exclusion to the behavior of the kidney. It appears in the descending pyelogram. Ureteral ligation was done with silk in a group of rabbits and dogs. Following this descending pyelograms were made at intervals from two hours to one hundred and thirty-two days and the resulting records were carefully integrated.

It was found that in the dog an animal which closely resembles the human being both in anatomical structure and functional reactions, the image of the endorenal cavity could be obtained for from five to seven days after the ligation, but never later than that. However the parenchymal shadow could be obtained, following the intrarenal injection of the opaque medium, at intervals up to two to four months after ligation. This latter phenomenon could be explained only on the basis of persistent activity of renal function for that period of time, even if the function were attenuated or equilibrated with reparative processes. The resorption of the opaque liquid was very rapid (about forty-eight hours) recent ligation, but required from ten to twenty days if the ligation had been done a month or more. In the rabbits as well as in the dogs, the ligations always are found to cause alterations of the hydronephrotic type and never of the trophic type.

It is concluded that in clinical pyelography complete ureteral occlusion of from five to seven days duration is not necessarily associated with absence of opacity of the endorenal cavity nor with absence of opacity of the parenchyma. When making descending pyelogram in such cases it should also be remembered that the rapidity of resorption of the opaque medium is somewhat dependent upon the length of time elapsed since the onset of the obstruction. F. W. M. DOWELL, M.D.

Bandler, C. G. and Milbert, A. H. An Evaluation of Recent Concepts in Renal Surgery *Surg Clin North Am* 930 20 157

It is evident that the trend in renal surgery has for some time been directed toward conservatism and minimizing of the morbidity and later complications. Perfection of technique has reduced the mortality rate of renal surgery to a level comparable to fundal operations on other major organs of the human body. Development and perfection of diagnostic methods in urology have not only enabled correct diagnosis to be made but often dictate the operative indication and possibilities have aided materially in the transition.

A variety of surgical procedures on the kidney have been presented and discussed, perhaps all too briefly. Many of them are time honored, but others are still of debatable value. In conclusion the authors would emphasize that a special, delicate surgical procedure that has limited application and intricate technique must, of necessity, suffer when employed universally and indiscriminately. Such has been, and probably will be, the fate of nephropexy, pyeloplasty and renal denervation. These procedures have a specific application, and only in the hands of the surgeon equipped with diagnostic acumen, technical skill and a thorough knowledge of urological anatomy and physiology will they receive proper recognition. D. F. M. M. D.

Palecako, L. Prolapse of the Ureter (Ureter des Hamleitenorfalls) *Arch Urol Klin Prag* 930 P. 3

Ectrocele is the cystic dilatation of the ureteral opening. In the days before the use of the cystoscope this condition was observed only during autopsy. The great value of cystoscopic examination is therefore quite apparent. An exception to this was the rare case which occurred in women in whom the cystic dilatation was of such high grade that after passing the bladder and the short female urethra it prolapsed in front of the vulva.

The cystic dilatation appeared to protrude into the bladder at the point where the ureter opened into this organ. When this dilated portion contracted again it became indented and could easily be compressed by the ureteral catheter. It placed its transparency may be enhanced by approaching it with the lamp of the cystoscope. If we observe this cyst for a longer period of time we can determine that it fills itself with the urine coming through the ureter. We saw what this rabbit is. This cystic dilatation then empties itself through the ureteral opening here upon the cyst all gain collapse. This process of filling becoming completely full, and emptying proceeded in rhythmic manner. The filling of this cystic dilatation may become so strong that the internal orifice, indeed even the opening of the ureter may become closed off by a valve.

Histologically these cysts consist of three layers: ureteral mucous membrane, bladder mucous membrane, and between these connective tissue of varying development, but through here and there the muscle and elastic fibers. The size of the patient range from ten to forty years. The ratio of male to female is 1 to 1.

The primary cause of the genesis of this condition seems to be congenital defect development of the bladder and ureteral musculature. Some cases regard congenital or acquired obstructions at the bladder end of the ureter. The cause others believe to be congenital narrowing of the ureteral orifice.

The symptoms are not at all characteristic, and frequently the condition may run a symptomless course. In the case of vague complaints cystoscopy alone may bring about clarification. Serious complaints ordinarily first make their appearance when the cyst has reached a considerable size. In the early stages the urethrocele has no effect upon the kidney, it is only when the obstruction becomes severe or when the ureter becomes completely closed off that stagnation in the portion above the stenosed part takes place, i. e., in general the complaints increase with the severity of the process. However, the objective findings and the subjective complaints are not always in direct relationship with each other. The diagnosis rests upon the cystoscopy. In addition to this the kidney on the side of the prolapse should be examined as to its anatomical intactness, its behavior, and function, even in cases in which the urine is clear and the patient is free from complaints.

From the standpoint of the differential diagnosis of ureteral prolapse, tumors and inverted bladder diverticula are to be kept in mind. The prognosis is favorable if the condition has been discovered early and no retrograde changes exist, in these cases true restitution may be accomplished by the removal of the cystically dilated end of the ureter. Should the disease remain undiscovered it may become extremely dangerous to the patient. If the urethrocele is first discovered when secondary changes have already developed in the kidney, the prognosis then depends upon the extent to which the retrograde changes of the kidneys have advanced and whether an infection is present.

An operative procedure can be avoided only in those cases in which the urine is excreted in sufficient amounts from the kidney. Treatment can be only operative, and the approach can be made either through the endovesical or transvesical route. The endovesical approach is accomplished by means of electrocoagulation which is done with the high frequency current. This procedure has abolished all other forms of treatment used until now. In the presence of bilateral urethrocele both sides should not be coagulated simultaneously.

The high bladder incision should be chosen for the transvesical operation. After the bladder has been opened the urethrocele is opened dorsally, the collapsed cyst walls may then be removed.

The urethrocele becomes dangerous because of the fact that its existence produces no typical complaints, the condition often develops slowly and latently and thereby endangers the patient's life. The importance of cystoscopy cannot be sufficiently stressed, not only in those cases in which the cause of the bladder symptoms, pus and blood in the urine, is not clear, but also in those cases in which in the presence of bladder complaints the urine is free from pus or other elements, as in these cases also a urethrocele may be present.

(E. ILLÉS) HARRY A. SALZMANN, M.D.

Hvams, J. A. Surgical Disorders of the Ureter
Surg. Clin. North Am., 1949, 20, 323

Because of its strategic position between two such important organs as the kidney and bladder, which are so frequently the seat of major disturbances, the importance of changes in the ureter cannot be underestimated. Any intrinsic or extrinsic obstruction of it may result in destruction of the kidney. It may be the primary site of pathological change, or it may participate in disease of either the kidney or bladder because of direct extension of this disease.

The significance of early diagnosis and institution of appropriate treatment is therefore apparent. In all conditions of the upper urinary tract or in obscure abdominal disorders, the possibility of the ureter as a causative factor should not be overlooked. With proper use and interpretation of modern diagnostic methods, the exact location and extent of the pathology can be ascertained preoperatively and the proper corrective measures applied, as adapted to the individual case. The majority of ureteral disorders are amenable to surgical treatment and their early correction may conserve and restore renal function. It may be impossible to foretell the reserve capacity of a kidney when its ureter is blocked, but the remarkable recuperative power of the kidney should be given full consideration.

The author presents more common disorders of the ureter and the particular type of surgical procedure he considers best adapted to their surgical correction.

D. F. MURRAY, M.D.

Bracklin, R. E. A New Method of Uretero-Intestinal Anastomosis Utilizing Peritoneum
Arch. Surg., 1949, 40, 658

The author presents a new method of uretero-intestinal anastomosis in which the intact parietal peritoneum overlying the ureter is included in a lateral submucous uretero-intestinal anastomosis. A necrosing suture is utilized to establish the uretero-intestinal opening.

The formation of a uretero-intestinal fistula is soon effected because of the presence of infection in the tissue under the necrosing suture. The edema in the surrounding peritoneum increases the tension of the necrosing suture and hastens breaking down of the tissue. Growth of epithelium then completes the production of a uretero-intestinal anastomosis.

A necrosing suture has been employed by the author in 52 consecutive implantations of the ureter into the colon in animals. After every transplantation the suture caused tissue necrosis which resulted in a ureterosigmoidal anastomosis. There is no tension on the ureter after this procedure, presumably in clinical application tension would be no greater than after the retroperitoneal implantation employed by Cabot. The chief factors contributing to the good results obtained with the method described are a ureter normal down to the uretero-intestinal opening and an epithelized opening into the intestine which is characterized by the absence of scar tissue.

The incidence of hydronephrosis and pyelonephrosis subsequent to implantation of the ureters into the colon has been reduced experimentally by a method which involves utilization of peritoneum and which dissection or trauma to the ureter does not occur.

D. C. M. and M. D.

BLADDER, URETHRA, AND PENIS

Mathé, C. P.: The Management of Intractable Cystitis Associated with Vesical Fistula and Osteomyelitis of the Pelvic Girdle. Report of 3 Cases Following Traumatic Rupture of the Bladder and Fractured Pelvis. *J. Urol.* 940, 43-543.

Three cases of long-standing intractable cystitis secondary to chronic osteomyelitis of the pelvic bone. Late complication of fracture of the pelvis and rupture of the bladder, are reported. All 3 patients were relieved by operation.

Three types of chronic cystitis are observed: (1) that resulting from traumatic rupture of the bladder associated with fracture of the pelvis, or luxation of the pelvic bones; (2) that due to osteomyelitis of the symphysis and ramus of the pubis occurring after operations on the bladder or to osteomyelitis of the pelvic girdle following operations on its component bones; and (3) cystitis due to tuberculosis, hematogenous osteomyelitis of the pelvis and thigh, usually occurring during childhood.

Chronic urinary infection which is associated with hematogenous and traumatic osteomyelitis of the pelvic girdle is due to complicating infected sequestra or involucra, abscesses, spontaneous rupture of the bladder, or osteovesical fistulas.

The diagnosis should be suspected in patients presenting chronic pyuria in which there is history of previous fracture of the pelvis or attacks of osteomyelitis in childhood. Rectal and vaginal palpation enables one to detect areas of distention in the bones making up the pelvic arch, of cystic sequestra, abscesses, or fistulous tracts. Cystoscopic examination enables one to visualize migratory bone fragments and sequestra, associated stones and the opening of fistulous tracts. Roentgen examination of the pelvic girdle demonstrates areas of rarefaction, and fraying of the bone margin due to osteomyelitis and periostitis. Cystograms show bladder distortion, displacement and communicating osteovesical fistulas.

Prophylactic treatment consists of hermetic diversion of the urinary stream by suture of the bladder into the skin at the time of the original surgical intervention for bladder rupture. Surgical treatment consists of sequestrectomy, curettage of the infected bone, debridement of infected surrounding tissues, removal of connecting fistulous tracts, and drainage of contiguous abscesses in conjunction with cystotomy or catheter drainage.

A extensive review of the literature reveals very few reports on the clinical entity of chronic cystitis resulting from traumatic and hematogenous osteomyelitis of the pelvic girdle associated with seque-

tra, bone formation, osteovesical fistulas and urinary calculi. A plea is made for greater co-operation between the general surgeon, orthopedist and urologist in order to stimulate more general recognition of this entity.

D. E. M. and M. D.

Arzoo, G.: Report of Radical Cure of Extrophy of the Bladder by Transplantation of the Ureters into the Sigmoid and Removal of the Bladder (Contributo clinico alla cura radicale dell'ectopia vescicale mediante innesto degli ureteri nel sigma colostomia). *Rivista di Anatomia* 1934, 16-384.

The author reviews theories of pathogenesis and methods of treatment of extrophy of the bladder with special emphasis upon the work of Coffey, Mayo Himmman, Higgins and Kirwin. He reports the case of a twenty-year-old male whose left ureter was transplanted into the sigmoid bowel in 1913 by the first method of Coffey. No data are available on the condition of the patient before or after the operation, but it is known from the patient himself that the postoperative course was characterized by severe chills and a high fever with pain in the region of the left kidney which gradually subsided and disappeared entirely however only after three years.

He re-entered the hospital in 1937 six years after the first operation. Phenolphthalein was found at that time to be eliminated more slowly on the transplanted side than on the right, and an intravenous pyelogram showed a diminution of function on the left as marked stasis on both sides. The patient had three or four bowel movements daily, the material being frequently rice alone. Laparotomy was again performed in January, 1938, and the second ureter transplanted into the sigmoid. This procedure the incision was carried only through the serosa and muscularis of the bowel and the ureter buried in these layers for a distance of 1 or 2 cm. the end being attached by sutures which penetrated the mucosa and included a rubber tube which had previously been introduced into the sigmoid. On the fifth day the tube was taken out and the urine was found to flow from the new transplanted ureter. The postoperative course was unremarkable. In February of the same year the bladder was removed. Subsequent studies showed no backflow of urine in the transplanted ureters but there was general dilatation of the left ureter and pelvis with some increase of the previously existing dilatation on the right side. Examinations were repeated in May 1939, at which time it was found that renal function had been maintained, and that the patient was able to carry on part of his normal activities. He urinated three or four times per rectum during the day and several times at night.

In discussing this case Arzoo stresses the advisability of transplanting the two ureters separately. He particularly defends the intraperitoneal route and points out the ability of the peritoneum to defeat infection. In evaluating the procedure a

a successful method of dealing with the problem of ectrophy he believes that although the ultimate prognosis of such cases is necessarily guarded, the absence of complications and the maintenance of an already impaired renal function in the reported case suggest that it is of definite value.

J MITCHELL-SWORTH, M D

McCown, P E. Carcinoma in Ectrophy of the Bladder. *J Urol*, 1930, 43: 533

A review of the literature of carcinoma in ectrophy of the bladder reveals 24 reported cases. The author presents another case and the surgical procedures employed.

The author is led to believe from the autopsies reported that carcinoma in ectrophy of the bladder does not metastasize as early as in the normally placed bladder, and he draws attention to the fact that more close attention should be paid to the prevention of infection in the upper urinary tract.

D L MURRAY, M D

Gavet, R. Leiomyosarcoma of the Bladder (Les leiomyosarcome de la vessie). *J d'ur et cl chir*, 1939-1940, 45: 320

The author reports 3 cases of leiomyosarcoma of the bladder in which the tumors were surgically removed. The first patient died a few days after operation of an ascending infection, and the two others after six weeks and three and one half months, respectively, with evidence of recurrence in spite of irradiation.

The author directs attention to the apparent rarity of this neoplasm as only 18 cases including his own have been reported in the literature. However, he is convinced that it occurs more commonly than is generally realized. It appears predominantly in the male between the ages of forty and sixty years.

The author discusses the possibility of the development of these tumors on the basis of malignant degeneration of a pre-existing benign leiomyoma. They may be classified into three types, depending upon their relationship to the bladder wall: (1) interstitial or intramural, which is the rarest, (2) submucosal, and (3) peripheral or excentric, which is the most frequent. They arise most commonly at the trigone and grow to varying sizes, some weighing as much as 3 lb. Grossly they resemble uterine fibroids and may be pedicled or sessile. Whereas they rarely invade neighboring structures, they characteristically produce metastatic infiltration of the bladder wall. Microscopically they are characterized by large myoblasts, undifferentiated round cells of connective tissue origin, and numerous mitotic figures.

In addition to the common clinical manifestations of malignant tumors of the bladder these patients complain of pollakiuria, marked dysuria, and hematuria. The urine is foul, thick, and contains blood clots and even particles of the tumor. Bimanual palpation usually reveals the tumor. The condition progresses rapidly and soon leads to

cachexia. Although the diagnosis may be suspected it can be made with certainty only by biopsy and microscopic examination.

The various methods of therapy are critically evaluated. The author is of the opinion that irradiation therapy is of little value. Theoretically total cystectomy is the procedure of choice but its practicability is doubtful, according to the author, because of the highly malignant and progressive character of the condition.

MICHAEL DUBAY, M D

GENITAL ORGANS

Lowsky, O S. Prostatectomy. Perineal, Suprapubic and Transurethral. *Surg Clin North Am*, 1940, 20: 351

The theories of the cause, the pathology, and the different methods of treatment of prostatic hypertrophy are reviewed. The author concludes it is undoubtedly a fact that perineal, suprapubic, and transurethral prostatectomy each has its place in urological surgery. The operation to be done depends upon the conditions found. The surgeon should be psychologically and technically equipped to perform the operation most suitable to the case in question. By limiting his surgery to one method only, the operator limits his usefulness to his patients.

It is recommended that prostates enlarged to a great degree intravesically be removed by the suprapubic route. Those greatly enlarged, which encroach upon the urethra and the vesical orifice and which do not have a great degree of intravesical intrusion, should be removed by the perineal route. Prostates with enlarged middle lobes, enlargements of the subcervical group, fibrous bars, and certain cases of malignancy are best removed by transurethral resection.

D L MURRAY, M D

Duhanov, A J. Fetoplin of the Testes in Children with Special Attention to Indications for Operative Procedures. *Pediatric Surg*, 1939, 58: 558

Observations on 35 patients with ectopic testes induced the author to accept the theory of dysfunction of the endocrine apparatus as the most plausible explanation of the etiopathogenesis of this condition.

The most common form of ectopia is the inguinal. If not complicated, this form does not exert any untoward effect on the function of the organ. None of the complications, such as trauma, incarceration, torsion of the spermatic cord, or malignant degeneration, is frequent enough to justify an operation in each case of undescended testes.

Ectopia is usually accompanied by a patent vaginal process, but clinically detectable inguinal hernia develops only in a very few patients, and in such cases it is the rupture and not the ectopia which requires an operation.

Orchiopexy as such does not produce a considerable stimulating effect on the development of the testis in an overwhelming majority of the cases. As a matter of fact, the excessive tension on the sper-

in the cord, resulting from the operation, may lead to marked atrophy of the testicle.

In the majority of cases a spontaneous descent of the ectopic testis takes place. This occurs, contrary to the widespread opinion, not infrequently in the second decade of life. After such spontaneous descent small, apparently atrophic organs reach within short time normal size.

Only serious subjective complaints such as pains appearing in the form of attacks, are considered by the author as the main indication for orchidopexy. If the subjective symptoms are slight or absent hormonal therapy is indicated.

JOSEPH K. NAR M.D.

MISCELLANEOUS

Roth, L. J. Sulfanilyl-Sulfanilamide (Disulon) vs. Sulfanilamide in the Treatment of Acute Gonorrhea in the Male. *J. Urol.*, 940, 43 493

A clinical study of the effect of disulon in gonococcal infections in the male was made and the results compared with those obtained when sulfanilamide was used. In the Out Patient Department 47 per cent of the 44 cases of acute gonorrhea treated with sulfanilamide showed cures in two weeks or less whereas 73 per cent of 8 cases of acute gonorrhea treated with sulfanilyl sulfanilamide showed cure.

Of 4 private cases of acute gonorrhea treated with sulfanilamide plus acridavine and potassium permanganate irrigation 75 per cent were cured within 2 weeks or less, and of 20 private cases of acute gonorrhea treated with sulfanilyl sulfanilamide plus daily irrigations of acridavine and potassium permanganate 90 per cent were cured within 2 weeks or less.

Three cases which did not respond to sulfanilamide were successfully cured with sulfanilyl sulfanilamide.

The dosage of sulfanilamide never more than 45 gr. daily. The dosage of sulfanilyl sulfanilamide as 45 gr. in the Out Patient Department and in the treatment of private patients 45 gr. the first two days and 3 gr. daily thereafter. Neither drug given more than two weeks.

The author believes that sulfanilyl-sulfanilamide is superior to sulfanilamide in attacking the gonococcus.

When response to either sulfanilamide or sulfanilyl-sulfanilamide is not immediate clinical cure is prolonged by from four to six weeks and it may be better to discontinue chemotherapy for other method of treatment to prevent unnecessary toxic effects due to the prolonged administration of the drugs.

The reactions from sulfanilyl sulfanilamide (35 per cent) were much fewer than those from sulfanilamide (60 per cent). D. E. MURRAY M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC

Levander, G An Experimental Study of the Rôle of the Bone Marrow in Bone Regeneration *Acta chirurg Scand*, 1940, 83 545

Most of the information in the literature concerning the bone forming activity of bone marrow can be relegated to the sphere of hypothetical obscurities. Data founded on exact observations and giving the possibility of drawing definite conclusions are still scantier. The question of what the causal factors are in the production of bone is still unanswered.

In seeking further knowledge about the tissue reactions associated with a fracture the author has conducted two sets of experiments by grafting bone marrow into soft tissues. One series was done on full-grown animals during a relatively long period of observation to find the maximum productive capacity of bone marrow as a bone regenerator. Twelve experiments were done. The period of observation varied between fourteen and fifty-eight days. In 5 instances bone formation was obtained.

In the second series the study was directed to the histogenesis of the newly formed bone. Young animals were used and the period of observation was between two and eleven days. Morphological analysis of the tissue reactions showed that the bone-marrow cells died. The new bone arises from mesenchymal tissue formed around the graft. In the author's opinion there are no pre-existing osteoblasts in the bone marrow. He maintains that the marrow stimulates bone formation through some inherent substance possessing the power of so influencing the non-specific mesenchymal tissue as to cause bone to form.

ROBERT P. MONTGOMERY, M.D.

Bosworth, D. M. An Analysis of 28 Consecutive Cases of Incapacitating Shoulder Lesions Radically Explored and Repaired *J Bone & Joint Surg*, 1940, 22 369

The author presents a series of cases of incapacitating shoulder lesions. Attention is directed particularly to the correlation of the symptoms, the roentgenographic appearances, and the pathology which was found. Since radical exploration was done in all the cases to avoid the overlooking of any gross pathology, the author believes that some report of the results is necessary to justify the extensiveness of the procedure used for inspection of the joint. No deaths, infections, or major catastrophes were encountered, and, except for those cases representing complete avulsion of the short-rotator cuff or musculotendinous separation, improvement in the pre-operative condition was uniformly obtained.

Photomicrographs, detailed drawings of the pathology found at operation, the operative procedures, and roentgenograms are presented.

The 28 cases are grouped into four classes as follows

- I Pathology not found, 1 case
- II Tendon lesions
 - A Complete avulsion of the short-rotator cuff (tendons of the supraspinatus, infraspinatus, teres minor, and subscapularis), 4 cases
 - B Laceration or avulsion of one or more short-rotator tendons in their substance or at their attachments, 17 cases
 - 1 Recent avulsion
 - a Of deep or superficial surface at insertion, 4 cases
 - b Of entire thickness of tendon
 - (1) Anterior portion of supraspinatus tendon, 4 cases
 - (2) Complete tendon or tendons, 4 cases
 - c With horizontal split, 1 case
 - d With fibrillation or fimbriation, 1 case
 - e Of cortical fragment at supra spinatus insertion, 1 case
 - 2 Old avulsion (crescentic type), 2 cases
 - C Musculotendinous separation of the supra spinatus and the infraspinatus, 1 case
 - D Calcification or ossification of the supraspinatus tendon (plus surrounding calcification and degeneration), 2 cases
 - III Bursal lesions
 - A Obliterative subacromial bursitis (frozen shoulder), 2 cases
 - B Laceration of the bursal floor without tendinous involvement, 1 case
 - IV Exostoses
 - A Sharp exostosis at the tendinous attachment of the greater tuberosity without other pathology, 1 case
 - B Rounded exostosis on the greater tuberosity associated with tendon laceration, 1 case

Although this classification is rather extensive for a small series of cases, it is necessary as the type of repair differed for each group.

Because of the gross appearance of degeneration of lacerated tendon extremities, the extensiveness of tendon-insertion injuries, and the necessity of repairing split-tendon defects of the short rotators of the shoulder joint, it was found necessary to develop some method of mobilizing the attachment of the supraspinatus and the infraspinatus tendons sufficiently to allow their transplantation downward on the humerus. It was found that, following division of the anterior border of the supraspinatus tendon and the posterior border of the infraspinatus tendon from the rest of the short-rotator cuff, these two tendons could be easily retracted from 1 to 1½ in downward beyond their usual position. Since these incisions left a wedge-shaped tendon, it was noted

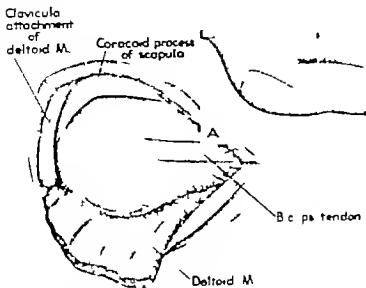


Fig. The deltoid, freed from the pectoralis major and its acromioclavicular attachment, is turned back and downward. The bursal roof is exposed. A "A" incision.

that on down and retraction the gap formed in the short rotator cuff by the release afforded by the incisions was again filled by the wedge-shaped supraspinatus and infraspinatus tendons. They are

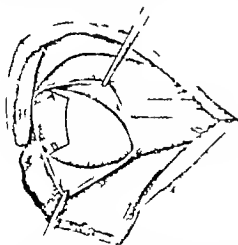


Fig. The bursal roof has been opened vertically and the line of incision of the attachment of the supraspinatus and the infraspinatus tendons is indicated. The incisions at A and B extend upward along the anterior and posterior borders of these tendons, freeing them from the rest of the tendinous cuff and allowing their mobilization.

retracted downward. It was also noted that downward retraction of these tendons for approximately 1 in. did not increase their tension on the muscles beyond that expected from normal muscle tone. Hence it only remained to cut a wedge-shaped area from the greater extremity of the same depth as the tendon substance and lift the tendons in place. This repair removes the distal portion of the tendons from the articular mobile portion of the joint together with any degenerative or other lesion localized in the distal inch of the tendon substance. The bursal floor if previously lacerated, has been replaced by that attached to the upper surface of the retracted tendon. This procedure has been carried out in 8 cases since June, 1934. The speed of recovery has been much greater than in the previous simple suture of the tendon end to the bony wall. It too recovers rapidly and reports the true end result.

Thorough inspection of the shoulder joint and complete and satisfactory repair of any gross lesion demands wide exposure. The division of the deltoid, when described, leaves no permanent clinical defect.

The chief importance of the deep surface incision lies in the fact that it is so well hidden. When the bursa is opened the top surface of the tendon, though still intact, may appear lightly yellowish or unchanged. Unless one directs under the anterior edge of the supraspinatus tendon, the basic pathological changes will be missed and the patient will not be benefited by operation. By passing a curved instrument through small slit in the anterior edge of the supraspinatus tendon, and by palpation of the finger box, the point of the curved instrument is

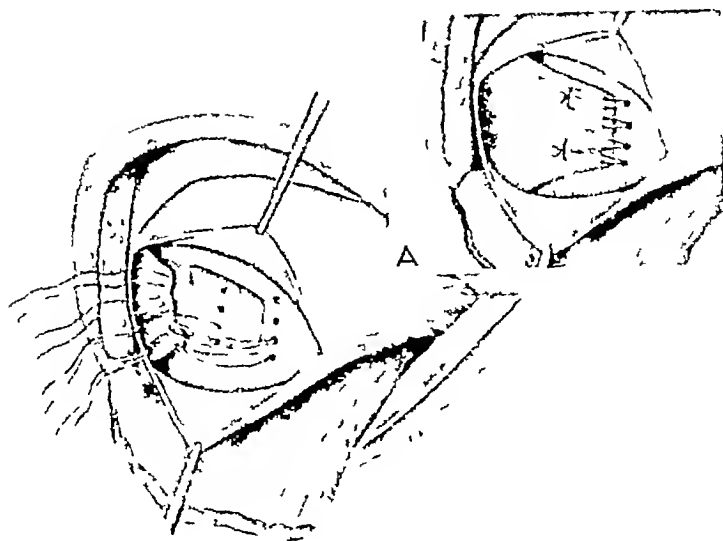


Fig 3 The two posterior mattress sutures have been led through the cortical drill holes from without inward upward through the cancellous bone in the floor of the defect, and thence upward through the tendon, emerging on its superficial surface about 1½ in proximal to its free cut margin

1 All four sutures have been passed as described and are tied across the tendon in pairs. The tendon is drawn tightly into the defect longitudinally and is bound down by the method of suture in close apposition with the floor of the defect. Note that the bursal floor on the superficial surface of the tendon has filled the defect caused by removal of the tuberosity area and that the distal inch or more of tendon has been removed from the actual mobile portion of the joint. The bursal roof remains intact ready for suture.

passes along the tendon, one can examine the tendon structure and attachment. Any irregularity or thinning of the tendon is then easily and definitely demonstrable. Diagnosis of suspected short rotator tendon laceration has been exceptionally accurate, but the lesion itself may be hidden and its demonstration may require more complete exploration than simple bursal incision. Moderate delay of operative interference in suspected acute ruptures does not prejudice the final outcome and is justifiable. Calcified shadows in the short rotator tendons may actually be osseous in formation and, therefore, impossible of removal by conservative means. Lacerations of the supraspinatus and the infraspinatus tendons show no gross or microscopic evidence of repair or of fibrosis, but they do show progressive degenerative changes with associated fibrotic lesions in the subacromial bursa and about the subscapularis tendon. Old crescentic lesions are the result of "tear and wear" and not of "wear and tear." Laceration of these tendons may be expected to cause progressive degeneration and increasing symptoms.

Recent avulsions of one or both of these tendons are the "typical cases" and show most if not all the clinical requirements demanded by Codman for rupture of the supraspinatus tendon. It is noteworthy that they constitute less than one third of all lacerations

of the tendons of the short rotators although the other lesions may be equally disabling so far as active laborious occupation is concerned. A new subacromial bursa formation may occur after complete obliteration following sharp dissection, replacement of the mobile elements at their highest functional point, and gradual lowering after healing. There is apparently a drawing out of new bursal lining from the portion of the bursa remaining under the acromion process. Repair of complete avulsion of the short rotator cuff is unsatisfactory, and primary shoulder fusion is indicated, especially when a complete axillary nerve lesion is present.

The new operative procedure described was used in 1 case for a musculotendinous separation of the supraspinatus and infraspinatus. It was not successful because the lesion could not be removed from the site of the actual mobile portion of the joint and a shoulder fusion may be required in this instance.

ROBERT P. MONTGOMERY, M.D.

Pacini, D. The Pathogenesis of Essential Epiphysitis of the Neck of the Femur (Sulla patogenesi dell'epifisiolisi essenziale del collo femorale). *Chir d'organi di movimento*, 1939, 25: 245.

The roentgenograms and case histories of 10 cases are presented, the literature is briefly reviewed, and

various hypotheses concerning the etiology are considered. The author concludes that:

1. The pathogenesis of the epiphyseitis remains an unsolved problem. The most accredited and plausible theories, namely, the vascular and infective do not seem to correspond with proved facts.

2. Endocrine alterations are often associated, but not a condition that could make them significant.

3. The condition has a rather long course, about one and one half or two years, and it is difficult to establish even in the phase of separation, the functional importance of weight bearing on the joint.

4. The epiphyseal line often disappears earlier on the side of the lesion than on the healthy side.

5. The best treatment is the closed reduction of Lorenz Whitman. The result of the treatment is dependent upon the phase of the disease in which it is initiated.

6. Cervico-epiphyseal nailing of the reduced separation does not accelerate the course of the malady nor shorten the period of immobilization.

Dr. A. McDOWALL, M.D.

Jack, E. A. The Etiology of Hallux Rigida. *Bris J Surg* 31: 7-40

The author studied a series of cases of hallux rigidus occurring in 5 patients in an attempt to evaluate the possible etiological factors. He finds that in practically every case there is evidence of an incompetent first metatarsal segment and that the condition of hallux rigidus precedes or is coincident with the early stages of psoriasis. The belief is expressed that the arthritic changes which develop are the result of multiple repeated minor trauma to the first metatarsophalangeal joint, these occur during the prepsoriasis stage of the joint, when the incompetent first metatarsal segment fails to carry its normal load in walking. (Dr. H. Laverne, M.D.)

Thornhill, A. J. Myositis Ossificans Traumatica. *Can J Bone & Joint Surg* 49:3, 33

Myositis ossificans traumatica is an inflammatory process of muscle in its early stages before ossification can be demonstrated by roentgenograms. The myositis is most apparent during the first 2 weeks following injury. The muscles involved are the ones often and extremely tender during this stage and the loss of function extraordinary. The clinical signs of "tumor, dolor, and calor" are all present. The author believes that there are signs of muscle inflammation, the early stages of development of true myositis ossificans, and that as ossification takes place later, the inflammation subsides and eventually disappears when the muscle function returns to normal.

The sequence of pathological changes is severe deep muscle contusion, accompanied by the tearing of muscle fibers and capillaries, and the loosening of peritoneal cells and hemorrhage. With the accumulation of inflammatory reaction that one could expect in hematoma formation and hematoma absorp-

tion, in which stage the ossification takes place. The latter occurs during the healing stage and not during the acute hemorrhagic inflammatory stage. The last stages of ossification show definite normal cellular bone.

The criteria for absorption of the ossification are its location, and individual diathesis. The smaller ossifications are absorbed, and those on the upper extremity except those near the elbow joint seem to have a greater ability to disappear completely. Those occurring in the belly of muscle become dormant and painless, and clinically the muscle is involved is restored to normal function, even in the most severe cases, but regrowth is incomplete. The myositis heals and normal muscle function returns although the ossification may not be entirely absorbed. An ossification which occurs at the origin or the insertion of muscle near joint however may regress and become dormant, but the muscle and joint function is never restored to normal.

The diagnosis of myositis ossificans is clear cut and apparent. A muscle contusion, receiving the usual careful physical therapy, in the course of four or five days does not seem to respond properly to treatment. The muscle involved becomes more acutely tender, more firm and boggy, and loses function. The striking feature is that the muscles involved in the contusion become more acutely sensitive to ordinary light massage. All such treatment should cease promptly. An traction over the contusion, even that from clothing, should be prevented. This stage is that of acute inflammation, acute myositis. The treatment should be rest and let the elevation of the inflamed part. The stage of ossification does not become discernible until between the seventh and the tenth first day, and then only with the aid of the roentgen ray. The inflammatory reaction subsides gradually in four days, and then limited motion, past the point of pain, can be permitted and instead of complete rest, gradual ambulation and motion are started. Heat, however, should be applied daily and regularly until the muscle function has been restored. As the ossification commences its absorption or regression, the inflammatory reaction subsides and normal function is restored to the muscle. At this point it is safe to permit the patient to resume normal activities even if the contact sport provided the original site of injury is properly protected from further contusion. Repeated trauma to this site of injury results in increased ossification of the area and prolonged period of non-absorption.

Preventive measures are proper padding in sport and avoidance of hemorrhage by the application of oil for one hour and the use of compressive bandage.

The sponge rubber like third point rule is out of usage in the early treatment of all deep muscle contusions. Greater areas of ossification have been produced by overenergetic massage with the third point rule of ordinary muscle contusions. The safer rule never apply massage directly to the area of tenderness, muscle contusion.

Operative removal of the ossification is contraindicated in any case in which it occurs in the belly of a muscle or on the shaft of a bone. Only in those cases in which it occurs at the origin or the insertion of a muscle or tendon, and in which the adjacent joint function is markedly impaired, is operation indicated, and then only after the process has become entirely dormant, from twelve to twenty-four months after the injury. Recurrence of the original myositis ossificans in even greater magnitude than that of the first instance will most certainly ensue if early operative measures are instituted.

Evacuation of the hematoma in the early stages of its formation is contraindicated. To accomplish this completely in deep muscle contusions requires careful surgery, necessitating further trauma and hemorrhage in dissection and suture, and tissue repair later, before active motion and function of the injured muscles can be started. The restoration of normal function following surgical evacuation of a deep muscle hemorrhage is unduly prolonged. Since evacuation of a hematoma, other than a superficial one by a needle puncture, is incomplete, the hazards are too great. Furthermore, the danger of spreading wider the loosened periosteal cells by either surgical or needle puncture evacuation is real. The aim of treatment should be to control the hemorrhage early by the application of cold and a compression bandage, and to minimize the size of the hematoma in so far as is possible by conservative measures only.

The bone most frequently involved in the author's series of 25 cases was the femur. Roentgenograms and summary charts are presented.

ROBERT P. MONTGOMERY, M.D.

Culp, O. S. The Treatment of Gonorrheal Arthritis. An Analysis of 200 Cases. *J. Urol.*, 1940, 43: 737.

Two hundred patients with gonorrheal arthritis were studied. Thirteen different forms of therapy were used. Sulfanilamide, intravenous mercuriochrome, and fever therapy gave the best results. Twenty-seven patients were treated by intravenous injections of 1 per cent mercuriochrome and 69 per cent of them were discharged as well or markedly improved. Generally three or four doses of from 10 to 30 c.c. were sufficient. A sharp rise in the temperature following an injection is an indication of the success of the treatment. Twenty-two patients were treated with sulfanilamide and 68 per cent were cured or markedly improved. The results appeared to be particularly good in the acute cases. The drug should be given in doses of 1 to 2 gm. with sodium bicarbonate every six hours until the blood concentration is 8 mgm. per 100 c.c. It should not be continued longer than two weeks and frequent careful studies of the blood are advisable. Nineteen patients were treated by fever therapy with good results in 53 per cent. Severe reactions and 1 death occurred. Marked improvement or cure was obtained in 9 with one or two treatments.

CHESTER C. GUY, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC

Blount, W. P. Osteoclasis for Supination Deformities in Children. *J. Bone & Joint Surg.*, 1930, 22: 300.

Supination deformities of the forearm occur following flaccid paralysis in the lower arm type of brachial palsy, poliomyelitis, and in fractures, especially when there is bowing of both bones in the middle third, angulation of both bones with the apices toward the interosseous space, and, in general, following open reductions when compared with closed reductions.

Persistent supination of the forearm renders ineffective an otherwise useful hand and it is objectionable cosmetically. These deformities resist correction by plastic operations of the soft tissues. Osteoclasis in the middle third of the forearm corrects this deformity in children. The bones of the forearm in paralysis are of delicate structure, there is osteoporosis, the cortices are thin, and the bones are small. The radius is usually bowed laterally and the ulna dorsally.

The author presents a summary chart of 9 patients in which 11 osteoclases were done. In all but 1 case complete fracture of both bones of the forearm was easily accomplished. The technique is as follows:

The affected arm is placed in abduction and external rotation, so that the wrist is near the shoulder. The forearm is as near midpronation as obtainable, with the dorsum toward the table. In this position, no important soft structures lie between the bones and a padded sharp wedge. The surgeon should stand on a bench with his hands grasping the forearm on either side of the wedge. With a quick straight arm thrust, the bones are fractured, usually incompletely. It is then necessary to reverse the force, manually breaking the bones entirely through. It is advisable to bend them back and forth several times to ensure complete fracture. The forearm can then be pronated between 45 and 90° and is fixed in this position by a plaster cast, which extends from the axilla to the knuckles, with the elbow in flexion.

If correction is incomplete, it may be advisable to obtain further pronation under anesthesia from two to three weeks later. It is sometimes necessary to apply a second cast. Six to eight weeks of fixation are required in older children and all possible pronation correction up to 90° should be maintained. Gradual partial recurrence of the deformity will take place. Following osteoclasis an increase rather than a diminution of the range of motion is frequently obtained and this motion is through a more useful arc, and the cosmetic appearance is improved.

Photographs and roentgenograms are presented.

ROBERT P. MONTGOMERY, M.D.

Pollidori, A. Results of the Surgical Treatment of Bone Cysts (Esiti della cura chirurgica delle cisti ossee). *Chir. d'organi di movimento*, 1939, 25: 213.

Forty-four cases of bone cysts are reported from the clinic at Bologna. Seventeen of these healed fol-

long fractures and immobilization and the remainder the subject of rigid intervention. After 27 operations there were 3 recurrences. 1 of the operations graft was removed from the tibia or fibula and in this group there were 16 recurrences. 1 of the operations merely closed the cyst and emptying of the cyst or opening and emptying of the cyst followed by filling of the cavity with bone muscle and in this group there were 3 recurrences. It is concluded that the difference in the results is not significant and that one can probably not formulate a very generalization from this series.

However, in studying the roentgenograms of the cases it was noted that there was considerable variation in the thickness of the wall separating the cyst from the medullary canal. In the small cysts, and also in a few of the larger ones, the medullary border was indicated only by a different tone of transparency or by a very slender line of condensation. In

another group, composed mostly of the larger cysts, the cyst was demarcated from the medullary canal by a very thick line of condensation. All of the recurrences were in multilocular cysts belonging to this second group. In these recurrences, the bony proliferation which filled the cavity prevented non-homogeneous appearance in the roentgenogram and the fusion with the preformed bone appeared impeded or retarded. In such cases after reoperation, which effected normal healing, the ossification of the cavity was homogeneous with that of the surrounding bone. It is suggested that the operation should include the destruction of this all but the cyst and the medullary canal and that a broad communication should be established.

FRED M. DOWD, M.D.

Stack, J. K., and Magnusson, P. B. The Nicola Operation: An Analysis of Failures. *Quart. Bull. Northwestern Univ. Med. School* 440, 4, 1935.

The Nicola operation, first reported in 1900, is essentially transplantation of the long tendon of the biceps muscle through a drill hole in the head of the humerus which makes it check when the arm is abducted and extended. Since 1932, the authors have used this procedure 9 times for the correction of habitual dislocation of the shoulder. Their failures and those reported by other are analyzed. Failure means (1) a recurrence of the dislocation, (2) limitation of motion sufficient to impair the function of the shoulder or (3) instability to the extent that the patient remains on guard against motions of abduction and extension.

In the ten cases following Nicola's introductory paper, 9 articles dealing specifically with this operation have appeared in the literature and 34 cases in which it was done have been reported. Eighteen of these operations (53 per cent) are considered failures principally because of redislocation. If Nicola's 5 cases, in which failures or 5 per cent are excluded, the end results of Nicola's operation performed by the other surgeons show failures 28 per cent (see table 1). Nine of the failures were re-

TABLE I — ANALYSIS OF REPORTED NICOLA OPERATIONS

Author	No. of Cases	Failures	Successes	Remarks
Lenoir (1901)	1	0	1	
Evans (1911)	1	0	1	
Robert (1913)	1	0	1	
Harris and Davidson (1915)	20	3	17	Transverse rupture of biceps tendon
Lucas (1915)	1	0	1	
Kocher (1919)	1	0	1	
Stack and Magnusson (1935)	9	5	4	Transverse rupture of biceps tendon Technical failures — most cases healed
Stanley (1935)	1	0	1	
Nicola (1936)	5	0	5	
per cent	55			Technical, but not bony
As reported				Technical, but not bony — most cases healed
Willard (1936)	20			
Wilson (1936)	1			Transverse rupture of biceps tendon — most cases healed
Total			9	

Reported failures and recurrences above are included in the total and are not analyzed in the text.

operated upon and in 7 the cause of the failure was apparent. In discussing these causes it is to be noted that 3 states the bony work subject to such trauma that no adjustment of the operation can be made in each case the injury as soon as sufficient to disrupt properly done operation.

The nature of the removal of the bony work places the responsibility for success of the operation on the biceps tendon (1) its actual inherent strength, (2) condition of the tissue of the operation, (3) the manner of its placement in the drill hole or (4) the position of the arm at the time of the tendon repair and fixation to the adjacent periosteum. The size and strength of the tendon may not be directly proportional to the size and strength of the arm, and given instance the tendon may not be strong enough to serve adequate suspension ligament. The tendon like the supraspinatus tendon is subject to lesion of attrition and the presence of such gradual fraying process the result of use.

All are valid grounds for the rejection of the procedure. Though Nicola's investigation of the tensile strength of the biceps tendon gives that normal tendon would be adequate to withstand reasonable strain the work of Norton, Morton, and Sullivan on the tendons of dogs tend to show that this actual strength is of importance only to effect the portion of the tendon between the head of the humerus and the superior lip of the glenoid. Their studies indicate that after the tendon is placed

in the bone tunnel it is rapidly invaded and after from six to nine months is converted into fibrous tissue to the extent that its tendinous structure can no longer be identified. The rupture of this tissue within the bone tunnel was considered responsible for the failure of the reported case of Horwitz and Davidson.

Nicola claims that in order to secure the best results the drill-hole in the humeral neck and head should emerge from the cartilaginous surface at least $\frac{1}{2}$ in from the lateral articular margin and failure to conform to this rule was the cause of failure in some instances. Suturing the tendon and fixing it to the periosteum and the transverse humeral ligament with the arm at the side rather than in 90 degrees of abduction were considered responsible for the failure in 1 case. The size of the drill hole through which the tendon passes should be such as to admit it snugly, and 2 of the reported failures were due to the fraying caused by movement of the tendon within the tunnel. A contributory cause might also be the failure to remove the tendon sheath which delays quick fixation within the tunnel.

The rapid acceptance of the Nicola operation may lead many surgeons to believe that this is the unequivocal answer to the problem of habitual dislocation of the shoulder but in the hands of surgeons other than the originator the Nicola operation failed to prevent recurrence of the dislocation in 18 per cent of the cases. If one adheres to the strict definition of failures mentioned previously, the number of unsuccessful results would be higher.

There is no question but that this method is a rational approach to the solution and one which the authors will continue to use, but they believe that many questions still remain to be answered. Since this problem deals principally with patients in their youth and early adult life one must ask "Will the transplanted tendon serve a lifetime?" If it will can the tendon accomplish this without undergoing change? The failures reported are instructive and only by such dissection of the field previously operated upon can one analyze and evaluate intelligently the results of this anatomical alteration.

F. HAROLD DOWNING, M.D.

FRACTURES AND DISLOCATIONS

Picot. Treatment of the Fractures of War (*Traité ment des fractures de guerre*). *Mém. l'Acad. de chir.*, Par., 1940, 66, 155.

Picot points out that in fractures of modern warfare, there is great danger of infection, especially from gas gangrene, and that since such infection arises in the soft tissues, these tissues must be treated first. The injured tissues must be excised, projectiles and foreign bodies must be removed, the wound should be cleansed, and bleeding must be controlled. The author maintains that the use of casts, or any other method of fixation of the fracture that interferes with the circulation in these cases, should be abandoned. He has adopted the method of reduc-

tion of the fracture by suspension with a metal wire for exerting traction on the fragments and maintaining them in position. In connection with the use of this method he has devised simple apparatus for the suspension treatment of different types of fracture. The Thomas apparatus is used as far as possible for transporting cases of fracture of the femur to the hospital.

In the World War the author treated in one month (July, 1918) 437 patients with fracture by the suspension method, 400 of these were sent to the hospital directly from the field stations. Three patients were dead on arrival, 37 were sent in from neighboring hospitals. The 434 wounded had 400 fractures, there were 338 fractures of the thigh, 9, of the leg, 50 of the humerus and 9 of the forearm. More than half of these soldiers had other wounds besides fracture. In all these cases from 20 to 40 c. cm. of anti-gas gangrene serum were given according to the nature of the wound. Amputation was necessary in 17 cases because of irreparable destruction of tissue, in 6 cases because of gas gangrene infection present on arrival of the patient at the hospital.

Of the 37 patients admitted from other hospitals and representing a selection of serious cases, 8 (21.6 per cent) died, all of streptococcal infection or septicemia. Of the 307 cases admitted directly from the field, 31 (7.8 per cent) died within a month, in 10 cases death was due to acute streptococcal infection, in 9 to shock or acute septicemia, in 5 to gas gangrene infection present on arrival of the patient at the hospital, in 5 to multiple wounds, in 1 to meningitis (complicated by head wound), and in 1 to bronchopneumonia (due to gassing). These results show the value of the methods used in the treatment of war fractures.

ALICE M. MEYERS

Van Gorder, G. W. Surgical Approach in Supracondylar "T" Fractures of the Humerus Requiring Open Reduction. *J. Bone & Joint Surg.*, 1940, 22, 278.

A method is described for the treatment of supracondylar "T" fractures of the humerus by open operation. The author stresses the fact that at the outset, that open operation is not commonly necessary for this group of fractures.

A posterior approach through the triceps brachii muscle affords adequate exposure of the lower end of the humerus, including the articular surfaces and joint line, as well as allows access to the bone through a region devoid of large blood vessels and nerves, once the ulnar nerve has been retracted. The approach also allows great freedom in the use and selection of metallic fixation.

The author emphasizes the need for careful planning of the type of fixation to be used, including bending of the plates to their proper shapes over a skeleton upon which the outlines of the fragments, when replaced, have been visualized.

In the operative procedure, a pneumatic tourniquet is used. A longitudinal posterior incision is made in the midline from 5 in. above to 1 in. below

the tip of the olecranon process. After widely dissecting the skin and subcutaneous tissues the ulnar nerve is isolated and gently retracted. The superficial fascia covering the triceps muscle is then cut in the shape of a long tongue the apex of which is about 4 in above the olecranon tip and the base of which spans the humeral condyles at the joint line. Care is taken to preserve a narrow margin of fascia along the muscular edges to facilitate the closure. The apex of the tongue contains only fascia but the depth increases to the base where all layers are included. After this tongue is reflected, another longitudinal incision is made down to bone and the bone and fragment are exposed subperiosteally. The closure the deep layers of the triceps muscle and the periosteum are approximated first to the midline after which the fascial tongue is returned back into place. This exposure is more satisfactory than the usual split triceps incision because the latter requires very extensive stripping and marked retraction to give complete exposure. Illustrations of the operations as well as roentgenograms and photographs of patient before and after operation are included.

There are 3 unsatisfactory results in 8 operations 1 of the unsatisfactory cases infection occurred in tourniquet was not used and hemorrhage which occurred required curtailment of the operative procedure. In the third case the humerus had previously been successfully operated upon from medial approach. In the second operation performed by the thor motion as established from 90 of flexion to 35 of extension to normal rotation.

ROBERT FORBES M.D.

Knoll, H. Follow Up Examinations of Elbow Fractures Treated by Immobilization (Nachuntersuchungen an stationär behandelten Ellenbogengelenkfrakturen) Cologne Dissertation, 1939.

More than 37 elbow fractures are reported 33 of which could be followed up. They are classified as follows: (1) T and Y comminuted fractures (6 followed) (2) fracture of the lateral condyle (8 (1 followed) (3) fracture of the medial condyle (9 (1 followed) (4) diaphyseal fractures (8 (3 followed) (5) fracture of the capitellum (6 (1 followed) (6) fracture of the trochlea (1 followed) (7) fracture of the radial head (8 followed) (8) fracture of the radial neck (9 followed) (9) fracture of the elbow (4 followed) and (10) fracture of the olecranon (5 followed).

In 9 cases cubitus valgus was discovered after effect of the injury in 6 of these the patient had been treated conservatively and in 3 the radial head had been exposed and seen (light muscle trophic was present (all treated operatively). The final result of the 36 treated conservatively are classified as good and good (flexion extension from 4 to 120 to 100 rotation not more than one third restricted) in 15 (3 per cent of the cases) passable (90 to 140 one half restricted) in 3 (8 per

cent) and a poor (less than 90 to 4 more than one half restricted) 1 (3 per cent. For the operative treatment that are followed up the results are very good and good in 61 (6 per cent) passable in 18 (5 per cent) and poor in 19 (5 per cent). In severe intra-articular fractures which are conservatively handled good results are also usually reported. If special complications which can not be laid to the procedure do not occur.

(H. CKE.) RICHARD WILKIN, M.D.

Hyman, G. and Martin, F. R. R. Dislocation of the Inferior Radio-Ulnar Joint as a Complication of Fracture of the Radius. *Brit J Surg* 26, 7-15.

A series of 35 cases of dislocation of the inferior radio-ulna joint is described and classified as follows:

Group I Anterior dislocation of the head of the ulna associated with severe Colles' fracture.

Group II Posterior dislocation of the head of the ulna associated with:

- (a) fracture of the shaft of the radius
- (b) fracture of the lower end of the radius

Group III Anterior dislocation of the head of the ulna with fracture of the shaft of the radius.

In describing the mechanism of the injury the authors point out that the strength of the radiocarpal articulation causes the hand and wrist to be carried with the distal fragment of the radius while the lower end of the ulna becomes passively dislocated in a direction opposite to that of the force of the original violence. There is disruption of the triangular fibrocartilage of the inferior radio-ulnar articulation with more or less disturbance of motion of the forearm the pronation being greater in Group I than in Groups II and III.

Treatment consisted of manipulative reduction, and the suggestion made that reduction of the elbow in the cast will afford better ultimate function.

(J. N. H. L. W. M.)

Hetzar, W. Traumatic Lesions of the Intervertebral Disc (Die traumatischen Schädigungen der Zwischenbänder. Würzburg: Medizinische Fakultät, 1939).

Charnier's fracture of the vertebral body has not been lawless. The fractures of the bodies of the vertebrae. They are simple closed compression fractures and attention has been accorded heretofore to the mild compression fractures. The author's main findings are: (1) complaints are pain in the cervical, thoracic and lumbar regions but the vertebrae are compressed and the intervertebral spaces are not injured. (2) the intervertebral spaces are not injured. (3) the intervertebral spaces are not injured. (4) the intervertebral spaces are not injured. (5) the intervertebral spaces are not injured. (6) the intervertebral spaces are not injured. (7) the intervertebral spaces are not injured. (8) the intervertebral spaces are not injured. (9) the intervertebral spaces are not injured. (10) the intervertebral spaces are not injured. (11) the intervertebral spaces are not injured. (12) the intervertebral spaces are not injured. (13) the intervertebral spaces are not injured. 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compression fracture. These may vary from a circumscribed marginal fissure to an avulsion of the fragments. "The fact that the outermost rim rises considerably above the plane of the vertebra endangers just that area which appears to produce extensive symptoms." In this respect buckling occurs less frequently in the upright position than in tilting or flexor movements. Many schematic drawings clarify the specific mechanisms. Marginal fractures are seldom seen in the more movable portions of the spine: the cervical and thoracic vertebrae; they are found mainly affecting the twelfth thoracic and the first two lumbar vertebrae, which are also the sites of predilection for compression fractures. The functional rôle of the muscles must not go unheeded in the foregoing lesions. This is well recognized in fractures resulting from the strain of lifting, in which the fifth lumbar vertebra is chiefly involved. Frequently, the force producing a marginal fracture is quite mild.

In all, the author considers 46 cases, which, in part he illustrates with case histories, some were recent, others old cases. The roentgen ray diagnosis is not always easy; also, the differentiation between recent and old cases is not always definite, for both lesions may produce zones of rarefaction. Still more difficult to recognize are lesions of the intervertebral disc, particularly in marginal fissure fractures. The nucleus pulposus is very elastic; usually the peripheral annulus fibrosus is damaged. Previously it was erroneously held that the preservation of the intervertebral disc established the differential diagnosis between vertebral fracture and inflammatory changes. However, in 30 per cent of the slightest marginal lesions the author demonstrated moderate narrowing of the disc. The latter was always evident in severe trauma; in many cases there was scarcely any intervertebral space remaining. As a rule, the superior disc is involved, since the superior vertebral table is usually damaged. One seldom sees cartilaginous nodes, since this depends upon the degree of nucleus pulposus damage. Immediately after an injury, roentgenograms show only an intimation, whereas four months later the cartilaginous nucleus may be significantly enlarged.

In conclusion, the author discusses the differences between the purely traumatic damages and the pathological marginal defects, which formerly were erroneously called marginal avulsions. The latter result from the undermining of the adjacent zone of bony rim by the cartilaginous nucleus (minor injury); they usually result from markedly forcible extension (extreme deflexion); they may be found in vertebrae of all densities, but chiefly in the fifth lumbar vertebra, which has a broad zone of suspension and in which displacement of the bony fragments is quite considerable. Except for the bone defect, the vertebral body shows a normal shape. In the healing process, the separation persists, since no bridging by callus formation occurs. The intervertebral disc participates indirectly as a result of the disc prolapse. In contrast, the purely traumatic marginal lesions of

moderate degree show the following change: they generally occur from a compressing stress (extreme flexion mechanism); they usually involve the first lumbar vertebra. The roentgenograms, as a rule, show merely a suggestion of a fracture line (delicate zones of refraction or condensation). Frequently, displacement is absent or slight. In mild cases there is mainly a moderate compression of the anterior border; in more severe, complete avulsion there is significant compression of the entire vertebral body. Later one finds healing of the bony defects by callus formation. The intervertebral discs are narrowed. (1937) JUDITH G. LINDSEY, M.D.

Boehler and Oswald: Results of Treatment of Vertebral Fractures at the Hospital of the Aix-la-Chapelle Society of Miners in Bardenberg. (Ergebnisse der Wirbelfrakturbehandlung im Krankenhaus der Aachener Knappschaft in Bardenberg.) Cologne: Dissertation, 1930.

Formerly spine fractures were considered severe injuries. Patients were dismissed with a supporting jacket because Kummel's disease was feared, and they were recipients of more or less prolonged compensation. Multi, for example, even recommended a disability compensation of from 20 to 50 per cent.

The methods of Magnus and of Boehler brought about a complete change. In the severe cases, it was revealed that the spine fractures healed well without protracted prejudice to capacity for work, and compensation was no longer necessary. Detailed quotations were made from the experiences of Magnus and Boehler. The contrasting results favored the Boehler method: of 30 insured patients 18 (60 per cent) were taken off compensation after one half year, 22 (75 per cent) after one year, 28 (95 per cent) after two years. Disability compensation was rated at 50 per cent in only 1 case, otherwise it was always under 35 per cent and an average of 25 per cent after twenty-five weeks. The Magnus method, on the other hand, showed that of 258 patients none were compensation free after one half year; only 33 (13 per cent) after one year, and 78 (30 per cent) after two years. For these reasons the Aix-la-Chapelle Hospital has followed the Boehler technique since 1931. Included, however, were all patients from 1925 to 1936: a total of 117. Seven had involvement of the cervical spine and of the remaining 110, 12 had involvement of the spinal cord. Of the latter, 4 died and the others drew a compensation of from 80 to 100 per cent. In total paraplegia resulting from transverse myelitis, the patients generally agreed to bilateral subtrochanteric amputations, thus they could ride well in an automobile and learned to get about on their stumps with the aid of their hands. The other 98 patients had compression fractures with little or no participation of the spinal cord. The twelfth thoracic and the first three lumbar vertebrae were most often involved. When the lumbar vertebrae were involved, transverse fractures were demonstrable only exceptionally. Fifty-nine patients were treated according to Boehler in supine suspension

after local anesthesia. First the symptoms of shock were permitted to clear and reduction was effected between the third and fifth day. After reduction an unpadded cast was applied, and the injured, since they were almost immediately relieved of pain, could then be put about on the same day. After four or five days they were discharged as ambulatory and given instructions for systematic exercises. The cast was removed after an average period of three months. A late collapse of the bone of Kummel's disease was never observed, which as true also when the Kummel method was used. After removal of the cast the patients were again admitted to the hospital for some time to order their management and exercises.

The mobility of the spine, as a rule, an entire undisturbed. Eight to fourteen days after removal of the cast patients were permitted to resume work with initial caution.

The author then compares the results of 55 cases seen during the years from 1931 to 1935, prior to the adoption of the Boehler method, with those of the 47 cases seen during the years from 1931 to 1935. Previously the method of Schmitz was employed after cessation of the shock symptoms, after about eight to fourteen days the patient was placed in the Engelmann traction apparatus with the head drawn up high, possible in a well padded head halter while the toes touched upon the floor and then plaster cast was applied. The difference is strikingly obvious, previously after three years only 3.5 per cent of the patients were reduced to from 10 to 30 per cent disability compensation, while at present the same ratio applies to 50 per cent of the injured after only 14 years. Of the latter group alone 48.5 per cent no longer draw any compensation whatsoever, however in general these former results are no worse than those of other authors according to Kummel after three years 37.7 per cent drew no compensation, while H. Mann reported 40 per cent and Berger 45 per cent. Their first period averaged 36.4 per cent and the second period 48.5 per cent. The period of treatment likewise compares approximately with those of other surgeons. The initial compensation reached 50 per cent, the first series and only 3 per cent in the second. A brace never prescribed later. They noted the advantage of their treatment, that the patients could be permitted to be ambulatory early and therefore received higher disability compensation for months before they resumed their occupations. I conclude numerous tables indicating the end result in individual cases are included.

(12) J. ROY G. FINDER, M.D.

Compere, E. L., and Lee, J. The Restoration of Physiological and Anatomical Function of Old Ununited Intracapsular Fractures of the Neck of the Femur. *J. Bone & Joint Surg.* 1935, 20.

The author describe method for obtaining internal fixation with bone graft in the surgical treatment of ununited intracapsular fractures of the neck

of the femur. The authors review other previously described methods of dealing with these cases and present illustrations of the salient features of most of them.

In the University of Chicago Clinics during the years from 1931 to 1936 union was obtained in 3 successive old ununited fractures of the neck of the femur by the use of not one but a tibial bone graft. The only difficulties involved are those inherent in all cases requiring prolonged bed rest in a plaster-of-Paris spica, especially in persons of advanced age stiff and painful knee or ankle and the difficulty of obtaining free beds for the period of time which has been found necessary. It therefore decided to use internal fixation of the fragment with three or more threaded wires to replace the plaster-of-Paris spica and allow early motion.

Reduction as carried out with the patient on fracture table and the bone mechanism distracted after anterior arthrotomy of the hip. The strong fibrous tissue and other structures about the joint are disturbed little as is compatible with accurate anatomical replacement of the fragment. With fitting tibial bone grafts are then drawn into previously prepared channels 5/16 in diameter drilled from the lateral side of the femur through the femoral neck into the head. Three or more stainless steel wires are then inserted to hold the fragments. These are also given with 5/6 thread at the neck. They are allowed to project from the lateral cortex to facilitate later removal.

Between May 1937 and August 1939, 5 cases were completely operated upon by this method after period of from 6 to eighteen months from the original fracture and solid bony union was obtained. A sixth, operated upon twenty-two months after the original fracture, gave an unsuccessful result because of infection occurring at the time of second operation for readjustment of wires that had penetrated too great distance.

The first patient was a male, 61 years old, after operation and after three crutches after ten days. Roentgenograms made at seven months post-operation showed area of absorption and compression of the femoral head, but the end of three years the motion at the hip was found to be 50 per cent normal. The infection in the affected hip the 4 other successful treated cases were also deemed excellent up to the time of the report.

Because of the tendency to partial collapse of the right bearing cortex of the femoral head in these cases the authors suggest that right bearing should not be permitted on the affected joint before six months after operation even if the union across the tract relapse would appear to be solid before that. If the roentgenogram reveals less than 50 per cent normal, the femoral head right bearing should be deferred for at least a year or till there is roentgenographic evidence of replacement of the calcification of the neck of bone. The hip should however be mobilized early.

R. M. J. POWERS, M.D.

Urrutia U C The Surgical Treatment of Congenital Dislocation of the Patella (Tratamiento quirúrgico de la luxación congénita de la rótula) *Rev de ortop y traumatol*, 1940, 9 203

Urrutia has reviewed 30 cases of congenital dislocation of the patella treated surgically by Putti at the Rizzoli Institute of Bologna. The protean aspects of the disorder in these cases have imposed such numerous variations in technique to meet the individual requirements that it may be said that practically all the different methods of treatment described up to now have been used. The lesions found included genu valgum, deformation of the femoral condyles, absence or alteration of the femoral condyle, deformation of the tibial epiphysis, internal rotation of the femur, external rotation of the tibia, smallness and ectopy of the patella, reduced contraction capacity of the quadriceps, and relaxation of the articular capsule and ligaments. The correction of these defects necessitated various interventions which may be classified according to the tissues on which they are performed, although several of these interventions were usually associated in one operation.

A variety of incisions has been recommended; the incision should be large enough to allow a good general view of the field and to permit change of the plan of operation, if necessary. The interventions on the bones consisted of correction of the genu valgum in order to change the axis of traction of the quadriceps (partial supracondylar section of the femur seemed to present sufficient advantages), limitation of the plane of displacement of the patella by creating an obstacle at the level of the external condyle (traumatic osteoperiostitis, insertion of a bone peg), deepening of the insufficient or changed trochlear groove to facilitate retention of the patella (the disadvantages are the necessity of long immobilization and in children damage to the growth cartilage), and elimination of the joint and resection of the patella justifiable only in extremely grave lesions.

The interventions on the capsule and ligaments, which were relaxed especially on the medial aspect in habitual dislocation and retracted in permanent dislocation, consisted of tightening and reinforcing the capsule on the medial side, and of making a longitudinal incision on the lateral side. This opening may be covered by tissue taken from the medial aspect or from any other site. These interventions were complementary to others and could not be expected to prevent reproduction of the deformity by themselves alone; they should be devised carefully to avoid tearing out of the sutures when mobilization is started and should be performed extra-articularly. The capsule may be reinforced by means of free grafts of fascia and ligaments may be constructed from sections of the patellar tendon; the fascia lata or the tendon of the flexor muscles of the thigh of the sartorius or of other muscles; these muscles are used to act on the patella. Medial transplantation of the tibial tuberosity with the patellar tendon attached to it is highly recommended.

The interventions on muscles were intended to utilize muscular action to maintain and pull the patella toward the medial condyle of the femur, to employ the tendons for the construction of strong ligaments, to keep the patella in place, and to facilitate the internal displacement of the entire extensor apparatus of the patella. For the muscular action, the vastus internus, sartorius, semitendinosus, semimembranosus, and internal rectus were employed; they were sutured to the internal border of the patella. The external vastus, which plays an important part in the dislocation of the patella, may be isolated from the quadriceps, partially resected, and fixed higher up to reduce its action.

The mixed interventions were the most effective and complete ones because they utilized the various components of the joint. At present, the interventions on the bones are generally limited to osteotomy, and all the procedures consist fundamentally in inward displacement of the extensor apparatus of the patella. Good results seem to be obtained with all the various techniques, as shown by the literature and the 30 reviewed cases. **RICHARD KEMEL, M D**

Wuethrich, A The Treatment of Fractures of the Head of the Tibia (Ueber die Behandlung der Tibiakopfbrakturen) *Arch f orthop Chir*, 1939, 40 71

The author reports on 70 typical fractures of the tibial head occurring during the past eleven years, of which 25 were seen for follow-up examination and 22 were followed by letter. The greatest incidence involved the years from thirty to sixty and males predominated in the proportion of 41 to 29. In the earlier years of life the breaks were mostly marginal infractions, compression-fractures, and, in more extensive breaks, minimal displacements. Fifty-one and four-tenths per cent represented accidents of transportation. Direct stresses included 71.4 per cent of the cases, and infraction by indirect force 28.6 per cent. In motor-car accidents the distinction between direct and indirect stresses was not always easily made. The instances of indirect force were mostly those of falling or leaping on a more or less extended leg. The manifestations were those of swelling with effusion into the joint, pain on pressure, and interference with motion, occasionally there was abnormal mobility. Nearly all the breaks could be grouped into fissured or impressed fractures, the first group was the largest, with 50 cases. In this group one or both condyles were broken off, the lateral condyle oftener than the medial. There were also cases in which the fissured break was combined with an impression fracture. The head of the tibia was involved 7 times however always with breaks of the lateral condyle or both condyles never when the medial condyle was the sole fragment split off.

Treatment in the vast majority of cases consisted in mobilization treatments after the effusion had disappeared, following treatment of the break by splinting, and compressive bandaging of the limb. Up to

the tenth day 51 per cent of the patients had begun with the mobilizing exercises. Few by the third day and the majority by the seventh to the tenth day. The exercises were first conducted on a fracture frame later on the edge of the bed. Exercises were conducted even while the traction was still being applied. Results were quite satisfactory with these frequent rather old patients and clinical treatment could in most cases be omitted at the end of the fifth to the seventh week the patient being confined to bed during four or six weeks of these periods. In 51 instances the fracture was immobilized in a plaster cast most of these were severe breaks. However the period of treatment was not essentially longer following three or four week treatment in a plaster cast than that required for treatment by mobilizing exercises.

Operative reposition of the fragment was attempted in cases while others operation was necessitated by definite indications. In these cases the fragments were retained in the desired position by placing wires around them and drilling holes into them. Injury to the semilunar cartilage and severe central compression breaks which could not otherwise be replaced and which interfered with the proper constitution of the joint were considered to be conditions which indicated operative interference.

The goal to be sought in any treatment is good mobility of the knee and firm supportive function on the part of the leg. Uncorrected dislocation of the fragment will cause arthritic changes. Follow-up examinations have shown that the form of the fractured joint once definitely established, can no longer be essentially influenced by the mobilizing treatments. In only 4 of 41 patients were there a indication of full motion in the healed joint. The mobilizing, or functional method of treatment is adapted only to the milder fractures.

The details of 41 fractures without displacement and 6 with displacement were appended separately as tables. It is to be emphasized that delayed displacement patients finally acquired firm walking gait of them with more or less good result as regards their functional capacities. However in contrast to the assertion from other sources it must be emphasized that subsequent functional use of the joint has no influence on its form. In those instances in which poor results were procured with the functional method of treatment they were attributed predominantly to compression fractures the more severe forms of which should be subjected to operative treatment like the more severe types of fissured fracture. It does not even rule out the traction, and under reposition with plaster-cast.

(Journ. Amer. Med. Assoc. 1934)

BLOOD TRANSFUSION

A Collective Review of the Literature from 1934 to 1939

THOMAS C DOUGLASS, M D , Chicago, Illinois

THE past five years have seen marked progress in the study of blood transfusion. The popularization of the simple nitrate method and the reduction in the frequency of reactions have stimulated the use of transfusions throughout the world. Probably the greatest contribution has been the development of the use of stored blood by the Russian workers, and its subsequent successful use in the Spanish Civil War. Acceptance of the rapid flocculation tests for syphilis has made transfusion safer.

Although the problem of the hemolytic transfusion reaction has been clarified by a host of investigators, its pathogenesis, treatment, and occurrence in transfusions which appear *in vitro* to be compatible are problems yet to be solved. Other aspects now being investigated include the effectiveness of transfusion, particularly immunotransfusion, in certain infections, the value of blood serum and lyophile serum in shock, burns, edema, and protein deficiency, and the properties and limitations of preserved blood.

THE EFFECTS OF BLOOD TRANSFUSION

The value of blood transfusion depends upon the increase in the volume of the circulating blood (Boycott and Oakley, Sibley and Lund), the addition of living red blood cells (Dekkers, Schiodt, and Woronow), which act as oxygen carriers (Gohrbandt, Niederle, and Haden [143]), the addition of platelets and plasma proteins (Aldrich, et al.), and the addition of prothrombin and presumably hemostatic and immune bodies.

A healthy adult donor suffers no harmful effect from the withdrawal of from 500 to 750 c cm of blood (Lundy [20] and Chvalivichy). The study of donors has revealed some interesting facts. Martin and Myers found a reduction of 310,000 red blood cells from four to six hours after 500 c cm of blood had been withdrawn, an average hemoglobin loss of 5.2 per cent and a weight loss of 1.2 lb. The red blood cells are usually regrown in from four to six days in man. Merklen, Israel, and Apffel examined 20 donors who had given from 2 to 15 liters of blood over a period of from one to fourteen years, and in only 1 was the red

blood count below four million. Cadham (54) withdrew from 65 to 140 c cm of blood at one-week intervals from six to twelve times without ill effect. Six months later all the donors were well and showed no blood changes. Transmission of disease to donors has been reported (Tzanck and Martineau [358]—septicemia, Klauder and Butterworth—syphilis, Wright—malaria). This danger, however, has been reduced by use of the newer direct transfusion apparatus and is absent in citrate transfusions.

INDICATIONS

The indications for transfusion have not been greatly extended in recent years, however, physicians are generally more alert to the indications (Cooksey [65]).

ACUTE HEMORRHAGE

Hemorrhage has been the prime indication for transfusion since the time of Lower.

In obstetrical and gynecological cases Stetson advocates transfusions of from 600 to 800 c cm as a minimum. Dieckmann and Daily believe that a substantial reduction of the obstetrical mortality from hemorrhage can be obtained if sufficient blood is administered to raise the hemoglobin to about 10 gm. Transfusion has also been advocated in functional uterine bleeding (Goudim-Levkovitch, Alovski and Burceva), for which Ehrhardt and Winkler recommend the use of blood of pregnant women.

The question of transfusion for serious gastrointestinal hemorrhage is unsettled. Some men (Creed, Turner and von Briesen) regard this condition as a contraindication, while others (Wood, Bock [36], Cooksey [65]) believe that there is no basis for the belief that a transfusion may start further bleeding, and they maintain that transfusions are hemostatic. Filatov, Majanc, Kartasevskii, and Doepp (111) found that 84 per cent of the patients recovered if a transfusion was given before shock developed, while only 40 per cent recovered if transfusion was delayed until after the appearance of shock. Transfusions have been more frequently used since Marriott and Kekwick (236, 237) demonstrated that large quantities of blood might be given very slowly and

From the Department of Surgery, Northwestern University Medical School and Passavant Memorial Hospital.

reported successful results as have others (Gill [126] and Lynch). Jeanneney has also demonstrated that use of combined vaccine (tetanus diphtheria, typhlococcus and typhoid) increases the bactericidal power of the donor's blood. According to these workers the donor who is capable of developing the greatest number of antibodies for the specific organism should be selected for such a transfusion. Lyons chooses the donor who possesses the greatest natural immunity as shown by the opsonizing effect of the donor's serum on the patient's cells.

Although some immune properties are preserved in stored blood, fresh blood is probably more effective in infections (Karavanov [182] Jorda and Vieu Grolinski, Kolmer).

Sepsis. There is some doubt as to the efficacy of transfusion in sepsis. Levin and Kartsevskij state that transfusion has an indifferent effect and that immune transfusion is as yet an open question requiring further clinical and laboratory research. Ma and others have a similar view (Blumberger [35], Haden [143], Dock [36], Erbshoe, Cooklev [65], Svejcar).

Cadham (35), Knodach and Frisnowich have had favorable results from the use of transfusion, while similar and more enthusiastic reports on the use of immune transfusion have been made by others (Govaerta, Kotthe, Dyson and Miller, Jeanneney and Choros, Bolter and Falta, McClenahan, Bacon, Stahl, Lyons, Kogan, GU [37]). Immune transfusions appear to have particular value in toxic sepsis (Perry, Shea, Gill [126], Lynch).

Transfusion in sepsis of puerperal origin is believed to give better results than in other types of sepsis, especially if immune donors are used (Van Damme-Gent, Kayne, Kutacha, Lisberg, Gosselin, Walker and King, Terechova, Keller and Limpach [84]). Small transfusions (50 to 150 c.c.m.) every day or every other day have been used.

Despite occasional isolated reports (Stenstrom and Grippall) of cures in cases of bacterial endocarditis following immune transfusion from donors immunized with an autogenous vaccine, most authorities agree that the condition is probably not benefited by transfusion (Sinek, Speldel, De Baker [86]). Kulore reported failure of immune (autogenous vaccine) transfusions to benefit cases of subacute bacterial endocarditis and stated that he did not believe that a single unequivocal cure is on record.

Cases of sepsis have recovered following the accidental administration of incompatible blood (Bourgault, Pallquin, and Hammerer) and Spuri-

donov has gone so far as to advocate this as a method of treatment. Such heroic treatment is not justified until we have a more effective means now available of combating bacterial infection reactions.

Scarlet fever. Blood in small quantities has been noted to produce a Schick negative reaction, but not necessarily an immunity as indicated by the Kellogg test (Thelander). Transfusion has not been found to increase the antitoxinolytic or antistreptolysin in recipients (Lippard and Johnson). These transfusions are of great value in the management of scarlet fever as clearly demonstrated by Zyzkov, Shekhet, Zavyalo and Medvedevskij who reported that 61 of 93 cases were aborted by immune transfusions. They used chiefly convalescent donors. Many others have had similar experiences (Bolter and Falta, Jennings, Vladek [36], Hamilton). Preserved blood older than 1 day is not effective (Zyzkov, Shekhet, Zavyalo and Medvedevskij).

Erysipelas. Blanchard and Bell reported that from 6 to 8 c.c.m. of blood per pound of body weight given every other day will carry a patient over a critical period of erysipelas. Bradford regards this use favorable while Hamilton believes it of little value.

Measles. Zingher has found that measles may be prevented or aborted by the injection of from 5 to 40 c.c.m. of serum, plasma, or whole blood from convalescent donor. Bolter and Falta, and Blumberger (35) have had good results in the treatment of measles, but Hamilton is of the opinion that it is of less value in this condition than it is in scarlet fever.

Diphtheria. Seckel reported that the mortality was lowered in malignant diphtheria from 80 to 4 per cent in a series of 42 cases. Blumberger (35) and Bolter and Falta have also had favorable results.

Typhoid fever. A recent report of 41 cases by Lantin and Guerrero showed a reduction in mortality of 50 per cent by the use of transfusions. Several investigators have also reported marked and dramatic improvement in severe cases of typhoid fever treated by immunotransfusion (Jennings, Blumberger [35], Habel and Cohen). Sinek is not convinced of its value in this condition.

Interfering poliomyelitis. Rosenthal (295) believes convalescent blood is more effective than convalescent serum. Sherman has reported some reduction in mortality with immunotransfusions, but Gav found no difference in the incidence or extent of paralysis in a small series of cases treated by transfusion.

Undulant fever Creswell and Wallace have reported apparent cure in 2 cases of undulant fever treated by immune transfusions Poston and Menefee Blumberger (34) and Cooksey (65) agree that the results are striking in this disease

Pneumonia In lobar pneumonia transfusions have been used infrequently probably because of the fear of increasing pulmonary edema or causing reactions Arenz reported a shorter duration of the illness and a lower mortality in 24 patients given 20 c cm of blood per kilo th in 35 controls Acuna and Hernandez, MacNair and Neil, and Shipton and Laves have also had good results with this treatment

Miscellaneous infections Many other conditions in which transfusions have been used are influenza (Tzanck [354]), meningitis (Walker and King, Schmidt), rheumatic fever (Vidos [364], Rosenberg), ulcerative colitis (Boller and Ialta, Bradford, Smek, Hulst and Hartog), peritonitis (Jennings and Ringenbach [172]), pemphigus vulgaris (Scherber, Lorich), pveitis of pregnancy (Douglass and Laughlin), empyema (Schlegel and Bridford), serous tuberculous (Krizhevski), lympho granuloma inguinale (Brady), kala azar (Mathieson and Watson), herpes zoster of the cornea (Frey), Weil's disease (Lescher), psittacosis (Boller and Ialta), epidemic encephalitis (Wiener), and bronchopneumonia (Murino, Tassovitz, Clement, Acuna and Fernandez, Vira)

INDICATIONS

Nephritis According to DeBakey (80) and Bock (36), nephritis constitutes one of the chief contraindications to transfusion because of the possibility of hemolytic reactions, elevation of the blood pressure, or aggravation of the kidney lesion Mosenthal states that transfusion aids in uremia by combating edema and by relieving the secondary anemia in nephritis For these reasons he believes that transfusion is often indicated in nephritis He has shown that anuria following transfusions occurred no more frequently in nephritics than in non-nephritics, moreover, some actually developed a diuresis He also believes that early in the course of nephritis the giving of blood often results in a long remission of the secondary anemia Cooksey (65) also believes that blood is of value in early nephritis and in cases with a nephrotic edema The successful use of concentrated solutions of "lyophile" serum in the treatment of nephrosis has been reported (Aldrich, Stokes, Killingsworth, and McGuinness)

Methemoglobinemia from any type of poison has been treated successfully by means of transfusion or exsanguinotransfusions (Majanz, Niederle,

Boller and Ialta, Jennings) Many other types of poisoning have also been treated by transfusion, carbon monoxide (Wiener) mercuric chloride (Hisinger and Simon), arsenic immune poisoning (Boon) calomel (Meyboom) strychnine (Boller and Ialta), and mushroom (Boller and Ialta)

Some other indications for which transfusion has been suggested are marasmus (Thompson), malnutrition in infants (Clement, Debre et al), arsenic immune dermatitis (Kuske), pyloric stenosis (Debre et al), gastroduodenal ulcer (Rives and Strokov, Bagdasarov, et al [13]), diabetic coma (Arborelius, Boller and Ialta), blackwater fever (Blickie), rickets (Wolff), marasmus gravis (Marinesco), dementia praecox (Reiter), and Winckel's disease, pellagra, and bronchial asthma (Wiener)

CONTRAINDICATIONS

ACUTE PULMONARY EDEMA

Acute pulmonary edema is the one absolute contraindication to blood transfusion on which most authorities agree (DeBakey [80], DeGowin [86], Collier, Cooksey [65]) Many other contraindications have been mentioned but Wood and Haden (144) believe that no contraindication exists if anuria threatens the life of the patient Although DeBakey (80) believes that nephritic conditions associated with anuria or oliguria are contraindications, Mosenthal and others disagree (Cooksey [65], Aldrich, Stokes Killingsworth and McGuinness) Bleeding ulcer, bleeding varices, and pulmonary hemorrhage are not absolute contraindications if care is used in administering the blood Embolism and purulent thrombophlebitis have been mentioned as a contraindication (DeBakey [80])

SELECTION OF THE DONOR

Male donors from eighteen to forty-five years of age are generally preferred because of their size (DeBakey [80]) A careful history should be taken to exclude allergy, syphilis, and malaria, as well as acute infectious diseases A physical examination with particular attention directed to the genitalia for manifestations of syphilis is essential A Kline test should also be performed on the blood of the donor immediately before the transfusion A blood count should be done for the protection of the donor

Typing For many years it has been standard practice to group recipients and donors into the divisions A, B, AB, or O as first described by Landsteiner in 1900 Subgroups (A₁, A₂, A₁B and A₂B) have been described, but because of technical difficulties have received little attention

except in experimental laboratories. Davidsohn () has recently reported a method for identifying these subgroups which he believes is practical clinically. The subject requires further investigation before its importance can be determined.

Hetero-agglutins Landsteiner and Levine in 1927 discovered that individuals possess heterogenous agglutinogens capable of producing specific agglutinins in rabbits. Three types of these agglutinogens were found and designated M, N, and MN. They are said to follow the same hereditary distribution as the iso-agglutinins. Identification of these agglutinogens is not at present practical in the ordinary clinical laboratory (Taylor and Ikin). It has not been shown that this property has any bearing on transfusions (BBnor [33], Taylor and Ikin). The chief value of this work to date is in the extension of the medical use of blood typing (Wiener).

The Moos hanging drop, the Vincent open slide, or the Landsteiner centrifuge method are the standard procedures used in typing (Wiener Larson Brewer [49], Cameron [56]). It is important that the specimen be agitated during the procedure (Culbertson and Ratchiffe). It has been shown repeatedly that a low-titer typing serum may cause errors in grouping (Larson, Davidsohn [77]). The most common of these are the mistaking of A or AB for Groups O or B respectively, because of the frequent low agglutinating titer of Group A (Taylor and Ikin, Davidsohn [77]). High-titer typing serum may be obtained from donors of known high titer by concentration of the serum (Hornworth and Mahoney) from patients with serum disease (Davidsohn [76]) or from the serum of rabbits sensitized by the injection of sheep cells (Davidsohn [77]).

Cross-match After the patient has been typed, a donor of the same group or a universal donor is obtained and a direct compatibility test is usually performed. Despite reports designed to show that the use of this test is not necessary (Horton and Watkins, Brines) most authors believe that it aids in detecting errors in typing and any abnormal agglutinins which may be present (Neter Martin [238], Simonin [322], Lescher Scannell Saye Lancu and Opinski, Larson, De Gowl [86], Wood Jennings, Rosenthal [294]). Oliver has reported the incompatibility of a Group AB donor 2 times in 44 trials on the basis of the cross-match. Some investigators believe that all hemolytic reactions may be avoided by care in typing and cross-matching (Bordley Margulies, Jones and Rathmell [176]). Compatible donors must be used for intraperitoneal transfusions (Clausen).

Donor services In order to provide donors to have been typed and are readily available for transfusions, a number of organizations have been established. In Russia (Bereva [51]) a voluntary donors organization has been set up with a central agency which guarantees the safety of both donor and recipient. The wide use of post-mortem blood has reduced the need for this agency in civil practice. Volunteer donor services organized by the Red Cross are also in use in England and Scotland (Black [28], Dyke Oliver). In most cases donors are not paid, but are available for calls from hospitals as a purely public service. Similar organizations are active on the European Continent (Traub and Andre [355], Seggel [31]). In this country the American Red Cross has organized donor units in many cities (Nelson, De Klein, Corwin). The Blood Transfusion Betterment Association of New York has an excellent organization which supplies professional donors to hospitals (Stetten). Citron has reported a private agency in a country community in which are listed 20 donors who have been examined, typed and are ready for any emergency. During the Spanish War it was evident that only preserved blood could meet the need for a large number of transfusions on short notice (Jorda [178], Ravenna). To provide blood in sufficient quantities donor services were organized in Madrid and Barcelona among the civilians. Blood was taken from the donors in a central laboratory filtered and sealed in ampoules to be transported to other parts of the city or placed on ice and later taken to any section of the battle front. Plans for similar organizations have been perfected in other European countries (Malouinnet and Jeannemy Morel). According to Levine and Katzin, about one half of the hospitals in this country maintain their own list of donors.

METHODS

A description of all the methods of transfusion would be of no value. It may be said without fear of contradiction that the great majority of methods now in use are satisfactory.

Direct transfusion in which the artery of the donor is attached to the vein of the recipient has been outmoded because of its inherent difficulties and dangers.

Indirect transfusions include all those now in use and may be divided into methods by which unmodified or modified blood is used.

Unmodified blood transfusions These include all methods utilizing paraffin-coated containers, athrombit tubes, multiple syringes, siphon, valve mechanisms, or continuous-flow apparatus. They

are less used at the present time than previously, following the popularization of modified transfusion techniques. Automatic ball-valve apparatus for changing the direction of the flow are to be condemned, because an accumulation of small clots prevents tight closure, and permits blood from the recipient to reach the donor (Levine and Katzin). The chief advantages of all unmodified methods are that the blood is rapidly and easily transfused without the addition of a foreign substance and without the presumably untoward effects of temperature change. The disadvantages of these methods are that they require considerable skill, necessitate rapid administration, and have the psychological disadvantage of requiring proximity of the donor to the patient. It might also be mentioned that the open methods require an imposing array of apparatus which may unduly impress the patient with the seriousness of his condition.

Modified blood transfusions. Sodium phosphate, hirudin, sodium iodide, arsphenamine, sodium hyposulfate, and magnesium sulfate have been used as anticoagulants, but sodium citrate is by far the most frequently used. Blood defibrinated by stirring has been used for transfusions but has been found to be more toxic than citrated blood and to deteriorate more rapidly (Bagdassarov [12], Fischer). A recent addition to the anticoagulants used for transfusion is heparin.

Sodium-citrate transfusions may be given by the open method as originally described by Lewisohn, or by a closed method which is far more popular at present. Advantages of the citrate transfusion are its simplicity, the feasibility of giving blood at the desired speed, and the favorable psychological effect on both donor and recipient in minimizing the procedure. Disadvantages of the citrate method are the addition of a foreign substance to the blood (Minot, Dodd and Bryan), and possibly the greater frequency of reactions (Parker, Eddy, Shea, Knoll and Schuerch, DeBakey [80]). Some investigators, however, (Brewer [48], DeGowin [87], Debré, Lamy, and Sée, Jeanneney [169], Lewisohn [213]), believe that sodium citrate produces no ill effects, and others (Clément, Meleney et al., Hustin and Dumont, Cooksey [65], Bates, Albright, Lewisohn and Rosenthal) find reactions no more frequent. Osgood believes that if a slight increase in the percentage of minor reactions does occur, the other advantages still far outweigh the disadvantages. Cooksey (65) in surveying the hospitals and their transfusion technique found 60 per cent using citrate transfusions. Levine and Katzin found the citrate method used as frequently alone or in

combination as all other methods combined. Those favoring a closed method point to the absolute sterility easily obtained and the absence of serious trauma to the cells. The use of a filter in citrate transfusion is unnecessary if the blood is given immediately (Wenzel and Hammer, Brewer [48], Cooksey [64]). The blood should be filtered if it is stored or fibrin clots have formed.

Heparin. Skold found that if added to blood in amounts of from 0.1 to 0.2 gm per 100 cc of blood, heparin would prevent clotting for from 105 to 120 minutes, and reported 17 transfusions by this method. In the same year Hedenus (152) found that 150 mgm of heparin injected into a donor prolonged the clotting time to from 15 to 29½ minutes and the effect lasted for one hour. There was no effect on the coagulation time of the recipient. This work has been confirmed by Knoll and Schuerch, and Schuerch. In 1937 Hedenus (153) reported the use of heparin in 150 transfusions performed by a semi-direct method. Others have also used heparin successfully (Clemens, Heim, Tretow, Grimberg and Krauss [139]). This substance may prove to be less harmful than sodium citrate as an anticoagulant, but its use has been too limited to permit evaluation at this time.

The temperature of blood. It has been the custom to warm modified blood before or during its administration, and various devices have been used for this purpose. Tuohy (351) and Vlados and Meerson (363) believe that the temperature is important in preventing or minimizing reactions, but their evidence is not convincing. Arev and Erikson (106) report that it is almost impossible to transfuse with blood warmer than room temperature even though it be heated to 140° F in the container. Tests of various warming devices yielded similar results. No disturbances were noted in dogs when cold transfusions were given (Arev). Because of the hemolysis occurring when preserved blood is overheated, some hospitals have discontinued this practice (Erikson [106], Gwynn and Alsever). Modified blood transfusions have thus probably always been given at room temperature. Since it is known that heat not rigidly controlled may be dangerous, it seems advisable to give transfusions at room temperature.

Routes of administration. In a great majority of cases no difficulty is experienced in the injection of blood into the veins of the recipient. When difficulty is experienced, unusual sites have been suggested: intrapertoneal (Koenen and Vonk), intramuscular (Lundy, Tuohy and Adams [222]), the abdominal aorta (Tuohy [352]), direct injection into the heart, or the longitudinal sinus. These methods are not without danger (Levine and Kat-

zin, Clément Debré Lamy and Sée) The surgical exposure of a vein seems a more logical and a safer procedure. Descriptions of technique in exposing a vein are given by many authors (Spivek, DeBakey [79] Prioleau)

Rate of administration. Unmodified blood transfusion requires speed to prevent clotting, and the average speed in such a transfusion is said to be from 50 to 100 c.c.m. per minute (Wiener) A slower rate has been thought more desirable by many authors (Wiener Bates, Clément, MacNab Krijasimaki Vlado and Meerson [363] Taub [351] Tzanck and Dreyfus [357] DeBakey [78] and Rathmell and Crocker do not agree that the rate of administration is important. One hundred cubic centimeters per six to fifteen minutes is considered safe for citrate transfusions.

Autotransfusion. In cases of ruptured solid organs blood found in the body cavities or viscera is often reinfused. Specifically the use of such transfusions has been reported in ruptured ectopic pregnancy (Tiber, Stabler Knaus, Hajek) intercranial operations (Davis and Cushing), hysterotomy (Wallingford [367]) wounds of the spleen or liver (Wenton, Tinker and Tinker Springer Andreen) stab wounds of the abdomen (Smith [377] stab wounds of the heart (Watson and Watson [369]) and hemothorax (Watson and Watson [370])

Contraindications to the use of autotransfusion are hemolysis—usually from sixteen to twenty four hours after bleeding—(Watson and Watson [370]) infection or malignancy (Wallingford [366]) and ruptured hollow viscus (Watson and Watson [370]) In reviewing 573 cases Watson and Watson [370] found 4 deaths believed to be due to hemolysis. DeBakey [82] and Wiener believe autotransfusion should not be used unless compatible donor is not available. However the availability of the blood and its relative harmlessness make its use desirable (Wallingford [366], Tiber)

Preserved blood. Although much research had previously been carried out on blood preservation its extensive clinical use is due to the excellent work of Shamov and Yudin. Yudin [384] in 1936 reported 1,000 transfusions with preserved cadaver blood, based upon the experimental work of Shamov

The Mayo Clinic first began using preserved blood from living donors in 1935 (Lundy et al. [1]) The stimulus of the Spanish War in which large quantities of preserved blood from living donors were given without difficulty, together with the favorable reports by Lundy [2, 253] led to the establishment of blood banks. Fantus

(137) and his group at the Cook County Hospital devised a scheme for preserving blood from living donors which is so successful that a great many institutions now have some sort of blood preservation laboratory (Hall, Erikson [55] Giddings and Kruger Patton Cameron and Ferguson [57], Biddle and Langley)

Blood for storage has been obtained from cadavers (Yudin [384]) placentas (Goodall [133]) or living donors. In this country the latter are by far the most frequent source. Rigid asepsis and the avoidance of agitation of the blood because of danger of increasing hemolysis must be observed in drawing blood for storage (Grimberg [138], Wiener)

Among the anticoagulants used are the solution HHT developed at the Moscow Institute (sodium citrate 5.2 sodium chloride 7.0 potassium chloride 0.50 magnesium sulfate 0.04, and water 1000 c.c.m.) sodium-citrate solution, sodium-citrate and glucose solution, Italian transfusol (Bartaglia and Tropeano) and arsenobenzol (Flischer)

Blood is stored at from 0 to 4° C. There must be no agitation of the blood. During storage a Wassermann test and blood typing may be done. All stored blood must be filtered before its administration as cellular debris and clots may form (Fantus [108] Goodall, Cameron and Ferguson [57], Tatum, ElBott, and Newet) Jorda [178] filtered the blood before storage and obtained excellent results. Opinion is divided as to whether or not stored blood should be heated. Many (Taub [35], Jorda [178] Altschuler and Cowell, Fourrester and Paillas) believe that cold blood may produce more reactions and for this reason they warm it slightly before injection. In order to avoid overheating, many laboratories allow the blood to stand at room temperature for thirty minutes before its administration (Erikson [106]) Attempts to sterilize blood by means of antiseptics proved ineffective when small doses were used, and destroyed the blood cells when larger ones were used (Fourrester and Paillas)

Bagdasarov [28] and Costa have stated that blood may be used after a longer period of storage if preserved in glucose solution. This finding has been confirmed recently by DeGowin et al. [84] and Gwynn and Alsever. Most workers, however, have agreed that blood should be discarded if not used within ten or fifteen days (Grimberg [138] ElBott, McFarlane and Vaughn [10], Filatov [1], Cameron and Ferguson [57] Fantus and Schurmer [108], Giddings and Kruger) Others believe that storage for a shorter time is advisable (Karavanzov [83], Belenkiy Hall, Belk Henry

and Rosenstein [25]) Although blood may be used after storing for a longer period, Lundy (224) avoids the use of blood more than a few days old by drawing little more than the anticipated requirement.

Certain changes occur in preserved blood regardless of the type of anticoagulant or the care in other factors of storage. Red blood cells persist longer than any other living constituent under storage conditions. These cells begin to show changes in form, such as crenation, by the third to sixth day (Jeanneney [169], Kolmer), and their number decreases about the tenth day, when hemolysis begins in most specimens. The longest period of preservation without hemolysis is possible in glucose-citrate solution (Grimberg [138], DeGowin et al [88], Belenkiy, Filatov [114], Doepp, Gwynn and Alsever) or IHT-glucose solution (Barton and Hearne). Adjustment of the pH may also retard hemolysis (Cotter and MacNeal). All authors agree that hemolysis of stored blood is a positive contraindication to its use.

White blood cells show degenerative changes much earlier than red blood cells. Of these, the polymorphonuclear leucocytes are more rapidly destroyed than lymphocytes (Gnonski, Jeanneney [169]). Vlados (362) showed that the number of white blood cells is reduced to less than 1/10 in from three to six days. Kolmer found that basophilic stippling occurred in twenty-four hours, and that practically no cells remained in two weeks. Platelets disappear more rapidly than other living cells in preserved blood, being markedly deteriorated in twenty-four hours, according to Kolmer.

Other changes found in preserved blood are decrease in glucose (Gwynn and Alsever, Jeanneney [169]), increase in phosphates (Balachovskii and Gumsbourg), slow increase in nitrogen, increase in the serum potassium up to 1,000 per cent (Scudder et al), diminution in sedimentation time, fall in respiratory capacity as the red blood cells are destroyed (Jeanneney [169]), and a rapid decrease in prothrombin (Rhoads and Panzer, Belk, Henry, and Rosenstein).

Because of the biological and chemical changes noted above, blood stored for more than a few days should be given only with the idea of supplying red blood cells, serum, and hemoglobin. Its chief use, therefore, is in cases of hemorrhage and shock (Kolmer, Flintus and Schirmer [108], Filatov and Doepp [114]). The value in cases of anemia, purpura, septicemia, and conditions with a high potassium value is questionable (Kolmer, Scudder et al, Belk et al [25]).

The advantages of stored blood are obvious. It is readily available in large quantities, may be typed and serologically tested at leisure, and is suitable for transportation. The disadvantages of stored blood are equally clear. Early reports (Karavanov [183], Bagdassarov [12]) showed a very high incidence of reactions which is believed to be due to the long period of preservation (Wiener). More recent reports show a reaction rate comparable to fresh citrate transfusions (Meyer, Weissman, and Wilkey, Giddings and Kruger, Cameron and Ferguson [57], Lundy, Tuohy, and Adams [223], Barton and Hearne). Fox and Belk, Henry, and Rosenstein [25] have recently reported an increased incidence of apparently harmless hemoglobinuria and jaundice.

For the small hospital the preservation of blood is impractical, as blood lost because of hemolysis and the inability to maintain a sufficient quantity of all types make it very expensive (Belk et al, 25). Reports from small hospitals in the Chicago district have shown that at least 60 transfusions per month are necessary to maintain a successful blood bank. For such hospitals a list of professional donors residing near the hospital serves as a very satisfactory "human blood bank." Most authorities agree that fresh blood is more desirable but that preserved blood fulfills a need in institutions where fresh blood cannot be obtained readily (Mingazzini, Filatov [112], Kolmer, Belenkiy).

PLASMA

Although not strictly within the scope of this paper, mention should be made of the recent uses found for blood serum or plasma. Methods for the collection and preservation of blood serum have been reported by Lehman, Burceva (53), Filatov and Kartasevskij (110), Tatum, Elliott, and Nesset, and Corelli. Some institutions with blood banks are siphoning off the blood plasma at the first indication of hemolysis and storing this plasma until needed. The successful use of serum or plasma in the treatment of operative or hemolytic shock was reported by Heinatz and Sokolow, Elliott (102), and Tatum, Elliott, and Nesset. Its use in burn shock has been mentioned previously. Many have also found it to be an effective hemostatic agent, equal to whole blood (Alovski, Burceva [53], Filatov et al [110], Kayarnovskaya et al).

The development of a method of obtaining a dry concentrated serum by evaporation at a low temperature has made available a substance readily soluble in water. Concentrated solutions of this evaporated "lyophile" serum have been used

effectively in the treatment of nephroids (Aldrich, Stokes, Killingsworth, and McGuinness) to reduce intracranial pressure (Wright, Bond and Hughes [381] Hughes, Mudd and Strecker) and experimentally in the treatment of animals in shock (Bond and Wright, Mahoney). Its use has been suggested in burns by Mahoney and Lehman.

Use of this concentrated serum for the purpose of increasing the agglutinin titer of serum for blood typing has been reported by Horworth and Mahoney.

It has been suggested that in case of war a center for the preparation and storage of blood plasma would be more valuable for use in emergencies than a blood preservation laboratory (Tatum, Elliott, and Vesset).

PLACENTAL BLOOD

Placental blood was first used by Robertson following the laboratory work of Rous and Turner (Barton and Hearne). Recent simplification of apparatus and investigation of its practicability have increased the interest and use of this source of blood (Bruskin and Farberova). Goodall (132) and his coworkers reported in 1938 that placental blood drained into a sterile flask containing an anticoagulant, typed, and preserved on ice could be used for transfusions. They believed that the high red blood count, the superior hemostatic power and the absence of allergic reactions made this source of blood a valuable one. The average yield from each placenta was 200 c.c.m. Most other authors have been unable to obtain such large quantities (Bruskin and Farberova, Page, Seager and Ward, Grodberg and Carey). Boland, Craig, and Jacobs, and Howkins and Brewer have found the amount obtainable too small to be practical. Goodall (132), and Gwynn and Alsever have found no predictable contamination and believe any organisms present are attenuated by preservation at a low temperature. This work was not confirmed by Boland, Craig, and Jacobs, who found 30 per cent of their specimens contaminated, nor by Howkins and Brewer 22 per cent of whose specimens were contaminated. Barton and Hearne make broth cultures when the blood is collected and use only those specimens showing no contamination. Disease in the mother, rupture of the membranes as long as forty-eight hours previously, prematurity and asphyxia pallida are considered contraindications to its use (Goodall [32]). Page, Seager, and Ward compared the red blood count on babies whose placentas had been drained with counts on controls, and could demonstrate no ill effects. Halbrecht, Gauthier, Keller and Linspach [87], Filippov, Morgantini et al. and

Grodberg and Carey have used placental blood successfully. Grodberg and Carey found that the blood group in the mother varied from the placental blood in 33 per cent of the cases. They also stated that a serological test should be performed at the time of collection of the blood because of the report of a case in which syphilis was contracted at the seventh month of pregnancy. Goodall (132) has reported 300 transfusions with two reactions and states that the blood may be kept for four months without ill effects. Barton and Hearne have recorded reactions in only 4.6 per cent of 78 transfusions of placental blood.

POST MORTEM BLOOD

Shamov first experimentally transfused dogs with blood taken before ten hours post mortem. Following his work, Yudin (384, 385, 386) used this method clinically. He found that blood could be taken within from six to eight hours after death from patients dying suddenly of angina pectoris, electrical shock, hanging, and the like and used for transfusions. Blood taken from the jugular vein of such cadavers clots, but in a few hours undergoes a liquefaction or fibrinolysis which makes anticoagulants unnecessary (Bogomolova and Kartanova, Yudin [384]). In 1938 Yudin (386) reported 2,000 transfusions of post mortem blood with mild reactions in 5 per cent and 5 deaths all due to hemolytic transfusion reactions. Contamination of post-mortem blood does not occur *in vivo* in less than from six to eight hours after death (Yudin [385]). That red blood cells from such a source live in the recipient has been satisfactorily demonstrated by Kryukov and Krilova, who found transfused cadaver blood in the circulation of a patient with pernicious anemia seventy days after transfusion.

The advantages of this large and very cheap source of blood are obvious. Aside from the disadvantages mentioned for preserved blood regard less of its source, post-mortem blood offers offense only to the sensibilities. For this reason it is not being used today outside of Russia.

It has been suggested that all soldiers be branded with their type so that when one dies suddenly his blood may be obtained for his fellow soldiers (Apostolean).

COMPLICATIONS

Although careful adherence to the plan set lined above for the selection of donor will aid materially in lessening the danger of transfusions, reactions do occur. These reactions may be manifested by hemolysis, fever, urticaria, pulmonary edema, or other somewhat rarer symptoms.

REACTIONS

Hemolytic reactions are the most frequent cause of death from blood transfusions. DeGowin (86) has reported 7 hemolytic reactions in 3,500 transfusions, Seggel (311) 7 cases in 2,105 transfusions, and Belk et al (25), 3 cases in 4,000 transfusions. The cause of this most dreaded reaction is frequently the use of incompatible blood (Tranck and Moline [350], DeGowin [86], Liengme and Martinet, Margulies, Baker, Lange and Hertz, Goldring and Grief). Bordley believes that definite compatibility of the blood has not been demonstrated in a single case of hemolytic reaction. Jones and Rathmell (176) reported 5,000 transfusions without a single hemolytic reaction in properly matched blood. Hemolytic reactions have been reported, however, which have followed transfusions of compatible blood (Pygott, Hansen-Pruss and Miller, Younge, Speidel, Sharpe and Davis, Littlefield, McCindless [241-242], Sinclair, Dinkler, Goldring and Grief, Smith and Haman, Hemingway and Hemingway). No satisfactory means has been found to date of eliminating or explaining the mechanism of these reactions in compatible groups. The use of different subgroups is believed to increase the number of reactions, but fatalities did not occur in the series reported by Filatov and Blinov and Doepp (113). Belk (24) believes that cold agglutination may account for some intragroup incompatibilities.

Another cause of hemolytic reactions is said to be the use of the universal donor for transfusions. Hesse has collected 46 cases with hemolytic reactions in which an O donor was used with 20 deaths resulting. Because of reports such as this, the term "dangerous universal donor" has become popular, and many warnings against the use of the O donor are found in the recent literature (Saxe, Larson, DeGowin [85], Martin and Whyte, Wille, Baumkruiff, Lescher). It is probable that some of these reactions may have been due to the presence of a weak A₁ agglutinin which was not detected in the donor (Davidsohn [77], Tatum, Elliott, and Nessel). There are also some Type O donors whose agglutinin titer is very high (Hesse [158], Muller and Balgarnes, DeGowin [85]). Hesse (158) has investigated 104 Type O donors and found that a large percentage of them agglutinated Type A or B cells in a titer of more than 1:32. He believes that agglutination in 1:16 or more may produce hemolytic shock. O donors are said to be more dangerous for A recipients than for other groups. Despite these reports, the use of O donors has been followed by no serious results in the hands of some authorities (Lundy

[222, 223], Blum, Brines, Tranck and Dreyfuss [356], Tatum, Elliott, and Nessel). Low titered O donors may be used without fear of reactions (Levine and Katzin).

Sensitization of a recipient by repeated transfusion may occur, especially when the same donor is used repeatedly (Plummer, Mossonvi, Neter), but reactions of this same type have been reported in the primary transfusion (Seggel [311]). Sensitization to the heterogenous factors M and N is believed to be of no importance in repeated transfusion (Blinov [33], Seggel [311]). Sensitization has been produced in dogs after repeated transfusions (McMuel, Burriel and Cowgill). The theory that hemolysis may occur without previous agglutination has been advanced, but no evidence is available to indicate that this is more than a rarity (Simonin [321]).

No relation between the quantity of blood transfused and the occurrence of these reactions was found by Goldring and Grief. McCindless (241) found that the amount of blood given in fatal cases varied from 250 to 1,000 ccm, while the quantities in cases which recovered varied from 40 to 750 ccm.

The pathogenesis of these reactions is not clear. Various theories have been elaborated to explain the symptoms and pathological findings. Baker reviews the subject and credits Yorke and Nauss with the first description of deposits of hemoglobin in the kidneys of rabbits after the intravenous injection of hemoglobin. The diet of these animals contained no green vegetables. Baker and Dodds demonstrated that hemoglobin deposits could be produced in the renal tubules of animals by the injection of solutions of hemoglobin only if the urine was acid. Bordley outlined four theories to account for the nephritis which frequently occurs: obstruction of the renal tubules by pigment deposits, anaphylaxis, metabolic disturbances affecting renal function, and toxic substances which damage the kidney. DeGowin (89, 90) and his coworkers were able to confirm the experimental work of Baker and Dodds. They found that in patients and in dogs the tubules of the kidney became obstructed by pigment casts in Henle's loops. There was a destructive process involving the epithelium of the convoluted tubules and an interstitial edema and necrosis of the central zones of the hepatic lobules. These findings were also noted by Goldring and Grief.

Petroff, Filatov, Bogomolova, and Strokova (276) noted a shock-like state in animals following the intravenous injection of homologous hemolyzed blood. This was accompanied by a marked narrowing of the lumen of the renal and splenic

vessels and a dilatation of the capillaries. This constrictor action was also demonstrated by Wesselin, Lindenbaum, and Kartashevskij who showed that it was not prevented by decerebration, sectioning of the spinal cord, division of the splanchnic nerves, removal of the celiac ganglion, removal of the sympathetic trunks, or denervation of the kidney. Ifin produced renal failure similar to that noted clinically by injecting dogs with human blood. Petroff and Bogomolova (274) showed that this constriction of the renal artery could not be produced by heterogeneous serum, but later the same workers (275) obtained a similar constriction by the injection of an aqueous suspension of white blood corpuscles. They believed the toxic effect was due to a histamine-like body. Jeanney and Ringenbach (173) have found the density of the blood to be increased during this shock.

A similar pathological picture occurs in patients dying of blackwater fever (Blackie) and from reactions to stored blood which has been overheated (Wilson and Jamieson). These observations indicate that the symptoms are due to the action of hemolyzed blood.

Symptoms of a hemolytic reaction may be immediate with shock, cyanosis, rapid pulse, severe pain in the lumbar region, restlessness, dyspnea, cough, and vomiting (Tauxek and Moline [359]). None of these symptoms may occur and this is said to be particularly likely if the reaction is due to the use of universal donor (Wiener). Death may supervene immediately but usually does not. A chill and fever may occur from thirty minutes to one hour after transfusion and may be the first indication of a reaction. Within one minute after the onset of symptoms (Oehlecker) a hemoglobinemia and a hemoglobinuria may be found. A transient jaundice may occur. After the first symptoms the patient may recover completely without further disturbances, and this is said to occur in from 35 to 50 per cent of such reactions.

In the majority of cases a period of apparent improvement is followed by signs of renal insufficiency with oliguria or anuria, nitrogen retention, and signs of developing uremia. Death may then follow in from four to twelve days with edema, coma, and convulsions (DeGowin [86], Tauxek and Moline [359], Goldring and Grief). In other patients, a marked diuresis presages subsidence of the symptoms and complete recovery. The longest oliguria on record with recovery is sixteen days (Goldring and Grief). The mortality was found by McCandless (245) to be 6 per cent in 20 cases collected from the literature. Lidge and Herr and Bordley have reported similar findings.

The treatment is unsatisfactory after symptoms have developed. The transfusion should be stopped immediately and the shock is treated by the usual methods. DeGowin (86) believes that the urine of all patients should be alkalinized before transfusions because this has offered protection to dogs experimentally. An attempt should be made to produce a diuresis by the injection of glucose. Hesse and Filatov (159) have demonstrated experimentally that the immediate administration of a compatible transfusion produces relaxation of the constricted renal artery. They have reported recovery in 24 of 26 cases thus treated. Margulies and Simonin (321) have reported favorably on this treatment. Helfatz and Sokolow reported 7 recoveries among 10 cases following the use of conserved plasma. These results await further confirmation. Bancroft has reported recovery following decapsulation of the kidneys.

Careful typing, cross-matching, and alkalinization of the urine before transfusion offer the best preventive measures at present.

Pulmonary edema is a serious and sometimes fatal transfusion reaction which occurs in patients with a well developed or incipient cardiac decompensation. A number of deaths have been reported (Plummer, Pygott, Briggs, DeGowin [86]). To prevent this serious reaction, many authors prohibit the use of blood in cases of cardiac decompensation while others believe that there is less danger in giving the blood slowly over a number of hours (Riddell).

Feverish reactions occur from thirty minutes to one hour following blood transfusion and are usually preceded by a chill. These reactions have been shown by Lewishohn and Rosenthal (214) to be due to foreign substances in the transfused apparatus. The simple expedient of washing the apparatus carefully with distilled water after each use reduced the number of reactions in their experience from 12 to 1 per cent. New apparatus is prepared by boiling rubber goods in 1 per cent sodium hydroxide for five minutes and then rinsing in distilled water thoroughly. Similar results have been reported by other workers (Wood, Leisher, Fantus, Seed and Schlimer [99], Filatov, Blinov and Doepp [13], Liengme and Martinet). These reactions though very unpleasant, are not serious and subside promptly within a few hours. Symptomatic treatment only is necessary.

Allergy The most common allergic reaction is manifested by an urticaria which is often extensive. This is probably due to sensitivity of the patient to food recently taken by the donor (Littlefield, Wiener, Price). These symptoms are

usually completely relieved by from 0.5 to 1 c cm of adrenalin (1:1000), and generally can be prevented by using fasting donors. Hancock reported a fatal reaction he believed to be due to an allergic reaction. Anaphylaxis is rare according to DeBakey (81). Passive transfer of the donor's sensitivity to a particular food has been reported. One patient had a persistent sensitivity to strawberries for three months after receiving blood from a sensitive donor (Holder and Diefenbach).

Uncommon reactions. Citrate was formerly severely indicted as a cause of reactions by Minot, Dodd and Bryan, as well as others (Manheim, DeBakey [81], Franco). Lewisohn (213), Melenev, Levine and Katzin, and Albright have found the number of reactions occurring in citrate transfusions to be comparable with that of reactions following transfusions of unmodified blood.

Incipient coagulative changes have been mentioned as a cause of reactions but it is too vague a term to warrant discussion. It certainly plays no part in a properly performed transfusion.

Embolism is a rare complication (DeBakey [81]). An intracardiac thrombus has been reported (Rouffart Marin). It is doubtful if air embolism ever occurs during transfusions, and Shulman and Glass state that it is harmless. DeBakey (81) has seen no air embolism in 5,000 transfusions.

Hemorrhage as a complication of blood transfusion occurs in blood dyscrasias. They may be gastro-intestinal, purpuric, or retinal (DeGowin [86]). Frey states that 60 cases of retinal hemorrhage following transfusion have been reported, 10 of them fresh. Of these 5 occurred in patients with a blood dyscrasia. Fatal intracranial hemorrhage has been reported in a baby during transfusion (Glaser, Epstein, and Landau).

DISEASES

Various diseases have been transmitted by transfusion and constitute a real hazard in choosing a donor.

Syphilis. About 68 cases in which syphilis has been transmitted from the donor to the recipient have been collected from the literature, and many unreported cases undoubtedly exist (Rein, Wise, and Cukerbaum). Kast, Peterson, and Kolmer believe that it is relatively infrequent considering the number of transfusions given. These workers found that only 9.5 per cent of professional donors had a positive serological test.

It is known that not all syphilitics are capable of transmitting the disease. Donors in the early stages of the disease are said to be more dangerous than those in a latent stage. Jones, Rathmell, and

Wagner (177) reported the use of 4 syphilitic donors only one of whom transmitted the disease. On the other hand, 1 donor may acquire syphilis and transmit the disease by a blood transfusion before the appearance of a primary lesion (McCluskey). Most authors believe that all syphilitics are potential transmitters, and that they should never be used as donors. The incubation period of transfusion syphilis is from one to four months, and the disease usually makes its appearance in the form of secondary lesions (Klauder and Butterworth).

Although a history does not exclude syphilis, even if it is so obtained could be relied upon, some donors may be excluded in this manner (Willis, Ronchese). A physical examination should be performed with particular reference to new or old luetic lesions (Ronchese, Salkind). Following reports that the sensitivity of the precipitation tests is greater than that of the Wassermann reaction, the Kline test has been recommended (Straus, Rein, Wise, and Cukerbaum, Klauder and Butterworth). This test has the additional advantage of being easily performed in about thirty minutes so that it may be done preceding each transfusion.

A combination of the history, physical examination, and Kline test gives the maximum protection from syphilis (Rein, Wise, and Cukerbaum, Stetten). In the absence of a serological examination various drugs have been added to the blood to kill the treponemes present (Orgnesyan, Salkind, and Kudryavtseva [267, 268]). Ackermann and Protosov suggested that neovospheramine be added to the blood to protect the donor from syphilis. Kast, Peterson, and Kolmer demonstrated that the addition of neovospheramine to blood in quantities of 10 mgm per 100 c cm of blood, completely destroys treponemes if allowed to stand fifteen minutes at room temperature.

Malaria. According to Wright (382), who has reviewed the literature, the first case of transmission of malaria by transfusion was reported by Woolsey in 1911. Since this time Wright has collected 29 cases from the literature. To eliminate this danger a number of criteria have been suggested. The examination of blood smears from donors is unreliable. The period of latency in the donor is no protection for a case has been reported twenty-five years after the original infection (McCulloch). It has been advised that the history of infection be used to exclude malarial donors (Zussman and Silver, DeBakey [81]). Thomas, Keys, and Dyke reported a case in which no malarial history was obtainable, but in which the donor had been in India. On the

bases of this report, Wright (38) states that all donors who have lived in a malarial country should be excluded. DeBakey (81) however states that in more than 5,000 transfusions which he has given or supervised in New Orleans, he has excluded donors on the basis of their history and has had no cases in which malaria was transmitted.

Other diseases which have been reported as being transmitted by transfusion are measles, influenza, small pox, septicemia, bronchial asthma, allergy typhoid fever (DeBakey (81), Wiener) and encephalitis (Beckman)

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SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Rapant, V. The Importance of Arteriography in Emboli of the Arteries of the Extremities (Zur Bedeutung der Arteriographie bei Embolien der Extremitätenarterien) *Chirurg*, 1939, 11 584

In spite of the essential advances that have been made in the surgery of emboli in the arteries of the extremities there have still remained some differential diagnostic and therapeutic difficulties. These difficulties are present especially when it is necessary to determine whether the ischemia of the extremities is produced by a classical embolus, whether it is due to a stormy course of an arterial thrombosis, or whether it is only an arterial spasm as a result of venous thrombosis in cases in which a so called "maladie emboligène" is not present. In contrast to these deficiencies of the clinical diagnosis, arteriography shows not only the topical localization of the embolus and the severity of the mechanical interruption (complete or incomplete embolus), but also reveals an approximate picture of the collateral circulation and explains the condition of the blood vessel and of even the eventual organic changes in the same. Thus it also becomes a good guide for treatment. The author reports a few of his own observations.

Case 1. A woman, aged thirty-two years and suffering for sixteen years with dilatation of the veins, was attacked in the same leg with febrile thrombophlebitis. Under clinical treatment the symptoms receded rapidly except for a hard band, which remained slightly painful. A few days after dismissal from the hospital severe pains occurred suddenly in the entire left extremity during the night. The diagnosis was embolus of the femoral artery. The treatment with eupaverin and strophanthin with glucose was without result and, therefore, the patient was referred to the Surgical University Clinic of Brunn. The signs of the disturbed blood circulation reached up to the upper third of the thigh, and they then receded slowly. The pulse was nowhere palpable in the vessels of the right leg. The skin felt cool, active movements were not possible and passive movements were associated with pain. These symptoms occurred first on the right side and later on the left. A bilateral arteriography with thorotrast was made and explained the condition after an exposure of the artery, carried out closely under Poupart's ligament, revealed a loss of pulse but no embolus at that site. The vessel was narrow and sinuous, parietal filling defects were present as in arteriosclerosis. The lancet-shaped ending of the filled popliteal artery, which extended up to the lower border of the tibial condyles, was striking and characteristic of spasm. There was an insufficient collateral circulation, but the signs (endarteritis) suggesting a chronic change

of the vascular wall were absent. The diagnosis was incomplete embolus of the femoral artery with considerable vasoconstrictor resection of the vascular wall and incomplete collateral circulation. By means of arteriography of the exposed right femoral artery the vessel was found contracted and pulseless. The artery was filled with fluid blood, just as the popliteal artery, and both had smooth sharp edges. The anterior tibial artery could be followed up to the lowest portions of the lower leg, where it ended with a lancet shape. The posterior tibial artery narrowed rapidly toward the periphery and could be followed up to the internal malleolus. Its course was markedly sinuous. The roentgenogram thus definitely showed that there was a micro embolus which proceeded rapidly toward the periphery and produced a marked vasoconstriction only in the region of the tibial system. On the basis of the arteriography no intervention was attempted on the right side, but an embolectomy of the femoral artery with subsequent periarterial sympathectomy of the exposed portion of the vessel was done on the left side. The surgically removed embolus was 14 cm long. In spite of the operation gangrene on the left side resulted and amputation was done on the third day, whereas the circulatory disturbances on the right side disappeared entirely after infiltration of the lumbar sympathetic nerve with novocaine.

Case 2. A woman, aged forty-two years, had never been sick before. In September, 1937, she had a febrile serous meningitis with slow recovery. On October 5, she felt severe pains in the left leg, which she could no longer lift. Eupaverin was without effect, and therefore she was referred to the hospital. The left lower leg and the knee showed a waxlike discoloration with numerous livid spots. These changes diminished rapidly above the knee. The pulse was not palpable and the skin temperature was cold. In the arteriogram the artery was well filled, and the popliteal artery was filled partially. There was no striking narrowing of the vessels. Their contours were sharp and smooth. The collateral circulation was relatively good and there were no organic changes. The section of the popliteal artery remained outside of the film, and the exposure was repeated with uroselectan after ten minutes. Shortly after the injection there were very severe pains in the entire leg with pale discoloration up to the hip. The patient could then suddenly flex the previously immobile leg, whereupon the pain soon eased and the leg assumed a distinctly bright red color, but this was less pronounced in the lower part. In an arteriogram taken then, the filling of the entire popliteal artery showed less contrast than in the former exposure, and the femoral and popliteal arteries had become narrower. The entire popliteal artery was filled up to the bifurcation. There was, therefore, an embolus above the bifurca-

tion of the posterior tibial artery, & the anterior tibial artery narrowed rapidly and its filling topped the border between the middle and upper third of the lower leg, while the posterior tibial artery was suddenly interrupted in its filling and ended in the form of a centrally convex arch. There was also marked vasoconstrictor reaction of the anterior tibial artery. Upon further administration of eupaverin the signs of the ischemia soon disappeared. Six months later recovery had occurred except for insignificant symptoms in walking, and when tested the patient no longer felt any symptoms. The pulse also had returned in the anterior tibial artery while that of the posterior tibial artery was absent. There were no cardiac symptoms.

Case 3. A woman, aged fifty years, had suffered with cardiac symptoms for many years. In November 1938 she had an amputation of the left thigh because of gangrene. At the end of December she was admitted to the Internal Medical Clinic for mitral stenosis and inefficiency with complete arrhythmia. There, on October 1939, the patient suddenly experienced severe pains in the right lower extremity with feeling of burning and formication in the foot and lower leg. The extremity was cool and pale, with small livid spots. The motions in the leg were limited and painful. The pulse was present in the femoral artery but not in the popliteal. The femoral vein showed no signs of a thrombosis. In the arteriogram the artery showed smooth contours and was well filled up to the joint cleft. In certain areas there were slight arch-shaped indentations of the arterial wall (spasms) and the ending had the form of a cephalad convex arch. There was no filling of the popliteal artery. The collateral circulation was good, especially in the region of the knee, so that only the anterior tibial artery showed a filling. The filling ended in the middle of the lower leg. There was no arterial filling in the lower portion of the lower leg nor in the foot. The diagnosis was embolus of the popliteal artery with an abundantly developed collateral circulation, which the filling of the anterior tibial artery provided. A resection of the thrombosed section was driven together with lumbar sympathectomy but the operation was refused and, therefore, infiltration of the lumbar sympathetic nerve according to the method of Leriche was done. The condition improved slowly and the leg was retained.

The author prefers thorotrast to iodine preparations as it is an excellent contrast medium and does not irritate the vascular endothelia therefore it does not increase an already existing vasoconstriction. As a rule the injection should not be given percutaneously. The author commends the accurate topographic-anatomical localization of the embolus in the arteriogram as it gives accurate information as to whether a vessel is not the site of several emboli, it shows the actual condition of the collateral circulation, and makes possible the differential diagnosis between classical embolus and vascular spasm, indicating clearly whether it is produced

by a micro-embolus or a massive venous thrombosis. (Boeck). *Louis Vril* 117 M.D.

Strombeck, J. P.: The Effects of Arterial Resection; Experimental Arteriographic Study (Effets de la résection artérielle. Étude angiographique expérimentale). *Arch. Chir. Sci.* 1940, 25, 318.

Strombeck reports animal experiments carried out to check on the results obtained by Fontaine and Schattner. Leriche's associates, in regard to the effect of arterial resection in cases of arterial obstruction. Fontaine and Schattner, in their experiments, produced thrombosis of a segment of the femoral artery by placing two ligatures on the artery 4 or 5 cm. apart, bruising the arterial segment between these ligatures, and injecting a few drops of whey or acid or coagulum, a corresponding segment of the opposite side was resected. Arteriography showed much better established collateral circulation on the resected side.

Strombeck's technique was different, and he claims that it shows more correctly the clinical conditions under which arteriotomy is done. The experimental animals were rabbits, in 6 animals viganol was given through the stomach 16 hours to 4 days prior to the operation on the arteries. With a view to hastening the development of an arteriosclerotic lesion. In each animal obliteration of a segment of the superficial femoral artery was produced on both sides by two ligatures, and histological examination of such segments showed that the lumen of the artery was obliterated by this procedure without the injection of a sclerosing solution. From seventeen to nineteen days later the arterial segment between the two ligatures as resected on one side, new ligatures being placed above and below the former ligatures. From two to one hundred and thirty-seven days later an arteriographic study was made on both sides by the injection of 5 c.c. of thorotrast into the left carotid artery and making

radiogram toward the end of the injection with this technique the arteries of the hind legs are well shown. Ten minutes later similar injection was given and another radiogram made the veins were slightly filled at that time. In 4 of the 7 animals there was no difference in the collateral circulation on the two sides. In 3 animals the collaterals on the resected side were somewhat larger and better filled with the opaque medium. In 1 animal the collateral circulation was better established on the non-resected side. It is noted that this latter animal is the only one showing marked arteriosclerotic changes following the administration of viganol. In 4 of these animals thorotrast was also injected into the arterial trunk just below the arterial segment ligatured. In 3 of these this trunk filled better with the opaque medium on the non-resected side. In 1 on the resected side. In 1 animal, the technique of Fontaine and Schattner was used, except that no sclerosing solution was injected into the ligatured segment. In this animal arteriography showed much better filling of the collaterals on the resected

side twenty seven days after operation. With his own technique, however, Strombeck finds that resection of an obliterated arterial segment has no definite effect on the collateral circulation.

ALICE M. MEYERS

BLOOD, TRANSFUSION

Fine, C. S., Alter, R. I., and Baptisti, A., Jr. Studies on Preservation and Use for Transfusion of Placental Blood. *Am J Obst & Gynec*, 1940, 39: 462.

Hematological studies of placental blood revealed that such blood would be desirable for adult transfusion if it could be collected sterilely, in sufficient quantities, and satisfactorily preserved. An attempt was made to confirm the work of previous investigators who claimed placental blood could be adequately collected and preserved and subsequently given in transfusions to adults with a minimal number of reactions. By using the usual bacteriological culture media, placental blood could apparently be collected and preserved sterilely, but the subsequent transfusion of these specimens was accompanied by a high percentage of reactions.

A comparative study of several different preservative solutions indicated that 7.5 per cent sodium citrate in normal saline solution is the most desirable solution. Further bacteriological studies, using special culture media, revealed that a high percentage of the collected blood was contaminated. Several modifications of the method of collection did not eliminate such contamination. However, the transfusion reactions could not be correlated with bacterial contamination or any other detectable factors, such as the amount of hemolysis, type of preservative, and the time of storage.

The authors' studies indicate that the biological significance of placental blood is somewhat greater than that of adult blood. Theoretically, the use of placental blood for transfusion is attractive, however, the technical difficulties encountered in its collection and sterile preservation are sufficient to make its use impracticable.

LEWARD L. CORNELL, M.D.

Gironés, L. Results of Blood Transfusion during the Spanish War (I. Ergebnisse der Bluttransfusion während des spanischen Krieges). *Med Klin*, 1939, 2: 1420.

The results of transfusion are varied judging from the discontinuance of this method of treatment. Transfusions should be done only in very serious conditions. There is a limit beyond which transfusion is useless. When the patient has marked motor nerve disturbance and does not react to external irritation, when the pallor is of a livid cyanotic hue, when the conjunctival reflexes are abolished and the pupils are dilated, transfusion is contraindicated. On the other hand, at times a remarkable result may be obtained. As an example, the following clinical record is given.

The patient sustained a gunshot injury of the abdomen. All usual methods of treatment were applied without any definite result. The pulse and respiration were hardly recognizable. Despite such ominous conditions, a laparotomy was done three hours after the injury and a massive hemorrhage was discovered. Three perforations in the ileum and 1 in the colon were sutured. During the operation the patient was practically pulseless. Then an 800 ccm blood transfusion was given. Even while the transfusion was being given improvement was noted, the pulse and respiration were better. The patient recovered.

Only a few patients had chills after the transfusions. Frequently a chill feeling occurs from four to six hours after the transfusion. The temperature rose to 38 degrees. Chills and temperature elevation were suffered by the donors after a few hours. These were ascribed to the injections of physiological salt solutions into the donors' veins. No different effect was noticed after the injection of pure sodium chloride (Merck) in distilled water, or tap water with the ordinary pulverized table salt sterilized by boiling. This information is important during war. According to the clinical course, the author divides the transfused patients suffering war injuries into 5 groups: (1) wounded soldiers in a desolate condition, the majority of them die during the transfusion; (2) wounded soldiers who do not react favorably during nor after the transfusion, and nearly all of whom die; (3) patients who react favorably, but die within twenty-four hours; (4) wounded patients who react well and remain alive; and (5) wounded patients who react well but die later from other causes. For the summary only the groups 2 to 4 are considered.

There were 4 stands ready from which 240 transfusions were given.

	Blood banks ready for transfusion			
	A	B	C	D
Positive results in per cent	80	66	59	53
Gun shot wounds cases in per cent	62	40	36	64
Average amount transfused	620 c cm	538 c cm	500 c cm	415 c cm

After twenty four hours there were 53 patients, i. e., 80 per cent, still living. The greater the amount of blood given, the more favorable the results. Direct transfusion from donor to recipient is predominantly the most effective.

(IRANZ) MATTHIAS J. SLEIFERT, M.D.

Gourévitch, G., and Kogan, D. Reactions Following Blood Transfusions (Material zur Klärung der Reaktion nach Bluttransfusionen). *Chirurgiya*, 1939, 7: 3.

The article is concerned with reactions following transfusions which were carried out in the regular manner and omits all complications resulting from technical errors. The authors base their conclusions

on 701 blood transfusions performed for the most varied indications. The reactions are classified as severe those with temperatures over 39° C. moderate with temperatures between 38° and 39° and light with temperatures between 37° and 38°.

Examples are taken from the large series of cases. In 240 transfusions in which both donor and recipient belonged to Group O reactions occurred in 43.3 per cent. In 16 Group "A" transfusions, 36.6 per cent. In 75 Group "B" transfusions, 4 per cent. In 5 Group "AB" transfusions, 20.4 per cent and in 9 transfusions with blood from universal donors, reactions occurred in 47.9 per cent. Thus, the transfusions of blood from universal donors gave the greatest number of reactions while the universal recipient group was the most favorable. Another table demonstrates that children up to one year of age showed no reactions following transfusions, while after the first year of life, age and sex exerted no influence on post-transfusion reactions.

The difference between transfusions with fresh citrated blood and those with preserved blood is discussed. Three hundred and ninety transfusions were performed with fresh, citrated blood with reactions in 33.8 per cent and 31 were performed with preserved blood with reactions in 45 per cent. In general, it can be said that although individual groups show certain differences, reactions following the transfusion of preserved blood occur more frequently but are distinctly less severe than those occurring after the transfusion of fresh, citrated blood. Furthermore the authors favor individual-

nate transfusion of the blood of universal donors, and characterize as invalid the objections expressed by others.

The authors then deal with the causes of post-transfusional reactions and share the viewpoint of Bogdanovitch in general. Experiments are reported with autotransfusions which were carried out under the same conditions as the usual transfusions. Reactions in 10 per cent of the same frequency (3) and severity as in other transfusions. The effect of citrate was tested, 16 patients receiving injections of 30 c. cm. of 6 per cent citrate solution. The reaction consists of reddening of the face and disorientation of from eight to ten seconds' duration. This citrate reaction pursues a similar course in all experiments and is regarded as entirely harmless. Thirty autotransfusions were conducted under particularly aseptic precautions and after special cleaning of the apparatus (washing and boiling with soap and lysol solution, 0.1 per cent caustic soda in distilled water and sterilization in autoclaves). In these transfusions there were only 5 reactions, 2 of which could be attributed to technical errors.

The authors conclude that the cause of post-transfusional reactions lies chiefly in the imperfection of materials, in addition to the frequent occurrence of an acid reaction of the distilled water used for the preparation of the citrate solution. They recommend the direct transfusion of blood by means of apparatus which has been cleaned according to the method described.

(Eliass) O. TANNON, ROSSINI, JR., M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE, POSTOPERATIVE TREATMENT

Beckerman, L. S. An Analysis of Determinations of the Chloride Content of the Blood in Patients During the Pre-Operative and Postoperative Periods *Vestnik khir*, 1939, 58 309

Determinations of the chloride content of the blood in 115 patients showed great variations of the sodium chloride, ranging from 425 to 590 mgm per cent. As a rule the amount of chloride in the blood of women slightly exceeds that of men. Hypochlorinemia is a nearly constant symptom of gastrointestinal obstruction but is not pathognomonic for this condition as it may be encountered in other diseases accompanied by dyspeptic symptoms, such as profuse vomiting or diarrhea, as well as in pneumonia, peritonitis, and a number of acute inflammatory processes. Hypochlorinemia is a nearly constant symptom of a mechanical as well as dynamic type of intestinal obstruction. The degree of diminution of the chloride content of the blood ranges as a rule from 10 to 30 mgm per cent. This phenomenon probably has no relation to the type of condition, or to the character or duration of the operative procedure. A fall of chloride in the blood exceeding 30 mgm per cent indicates an impending complication such as pneumonia or intestinal atony. The intensity of the fall in chloride content parallels the gravity of the toxic symptoms.

A diminution of the chlorides in the blood during the postoperative period exceeding 150 mgm per cent, in comparison with the normal chloride level before the operation, as well as a total chloride content below 300 mgm per cent, indicates a very grave condition, threatening the life of the patient.

In order to prevent postoperative complications in patients with hypochlorinemia, pre operative repeated infusions of hypertonic sodium chloride solutions and also blood transfusions are indicated.

JOSEPH K. NARAT, M. D.

Veal, J. R. High Ligation of the Femoral Vein in Amputations of the Lower Extremities *J Am Med Ass*, 1940, 114 1616

Pulmonary complications following amputation for vascular gangrene of the lower extremity are common and conspicuous. In two rather large series of cases previously reported, approximately half of the patients who died showed evidence of pulmonary complications. Although the diagnosis of these cases was usually pneumonia, the author believes that the pneumonitis was embolic in origin in many instances. Evidence obtained from dissection of the stump at post mortem showed thrombosis or thrombophlebitis of the femoral vein proximal to the ligature, and hence presumably this was the source of the emboli.

Dissection of the femoral vein in cadavers revealed many variations in its tributaries. The principle tributaries are the great saphenous and the deep profunda veins, the remainder of the branches enter the femoral vein, in many instances, in a constant and haphazard fashion. In certain individuals the muscular tributaries enter the femoral vein in a fairly regular manner so that the vein is assured of a fairly good blood flow at all levels. In other individuals the muscular tributaries are sparse and leave long portions of the vein devoid of branches. It is in the latter group that long thrombi are likely to form and subsequently lead to embolic phenomena following ligation at amputation.

In order to overcome the danger of embolism from thrombus formation in the femoral stump, the author performs a preliminary high ligation of the femoral vein in all amputations of the lower extremities. Twenty eight consecutive amputations have been preceded by this procedure, and in none of them has a pulmonary complication developed. The author believes that the mortality rate has been materially reduced by this simple procedure. The technique of ligation is as follows:

The great saphenous vein is exposed in the femoral triangle through a short vertical incision and is followed down to its junction with the femoral vein. The latter vein is exposed and ligated with braided silk just distal to the saphenofemoral junction. The deep tissues are closed with plain catgut and the skin with silk. Amputation is then carried out at the desired level.

The author has found that ligation just distal to the saphenofemoral junction is the most desirable level since no edema of the stump develops following this procedure. Furthermore, the flow from the saphenous vein insures a steady stream of moving blood which tends to prevent the formation of a thrombus.

LUTHER H. WOLFF, M. D.

ANTISEPTIC SURGERY, TREATMENT OF WOUNDS AND INFECTIONS

Gasné, A. The Use of Total Circular Plaster Casts in the Treatment of the Wounded in War (A propos de l'emploi des appareils plâtrés totalement circulaires dans le traitement des blessures de guerre) *Mém l'Acad de chir*, Par, 1940, 66 146

Gasné had opportunity to observe many Loyalist Spanish soldiers who sought refuge in France after the defeat of their government. In many of the wounded men, a complete circular plaster cast had been employed, encircling the thorax, arm, and forearm in wounds of the upper extremity, and the pelvis, thigh, and leg in wounds of the lower extremity. These casts had been applied to the wound without dressing and without fenestration.

In some of these cases the general condition of the patient was bad and there was definite evidence of infection. In the group recently treated there were 5 cases of tetanus, 3 cases of gangrene, and 1 case of gas gangrene. In the cases in which the plaster cast had been in place several months, the wound was badly infected and the plaster saturated with pus on removal of the cast, it was found that the wounds showed no signs of healing but in most cases in which only the soft tissues were involved thorough cleansing of the wound or irrigation with Dakin's solution resulted in healing. Only exceptionally was there any consolidation of fractures, and even in these cases there were definite areas of osteitis. In some cases of fracture amputation was necessary in others conservative treatment with thorough cleansing of the wound and later immobilization in suitable apparatus or a light plaster cast resulted in ultimate recovery.

Even in those cases in which the general condition of the patient was good, and there was no serious infection, fractures usually had not healed. However in a few cases in which the plaster casts had been worn for months, the fractures were healed and in good or fairly good position, the soft tissues were markedly atrophic, but the joints sometimes showed good function in other cases, joints were fixed in the position imposed by the plaster cast.

The results of this method of treating wounds with circular plaster casts (about previous treatment or dressing of the wound appear so unfavorable that the author considers that its use is contra-indicated, at least until after it has been modified and studied by skilled surgeons. *Arch. M. M. 1918*

Montanari Reggiani, M. The Infiltration of Novocaine in the Treatment of Acute Circumscribed Inflammatory Processes (*Sulla infiltrazione di novocaina nel trattamento dei processi infiammatori acuti circoscritti*) *Arch. Ital. di chir.* 1919, 55

Reggiani cites opinions for and against the use of novocaine in acute circumscribed infections, and reports a series of cases treated by himself. The patients were divided into three groups: 5 for whom local anesthetics as not employed, 5 for whom percent novocaine was infiltrated in quantities varying from 1 to 4 c.c. to 30 to 40 c.c., and 6 for whom novocaine was used 1 p.p.f. of 5, or of 7. In all the cases of the first and second groups, leucocyte counts and differential counts were made at intervals on the circulating blood, and on blood obtained from the periphery of the inflammatory zone. In the evaluation of the differential counts, the criteria advanced by Schilling were employed. The anesthetic was injected directly into the inflamed area, even after localization had taken place. The types of lesion treated varied greatly and included simple abscesses of the extremities, breast lymph glands and perianal lesions. The organisms were chiefly of the common pathogenic bacteria.

The results obtained in the first group were in accord with those obtained by other observers: the

peripheral white count varying with the intensity of the process and the force of the response and the peripheral count showing either a physiological level or a frank leucopenia. In the differential count the usual diminution of lymphocytes, monocytes, and eosinophils occurred, with a shift to the left three modifications being far more marked in the peripheral than in the peripheral blood.

The second group comprised 7 cases in which infiltration was practiced before suppuration and localization took place. In these cases it was observed that the signs and symptoms of inflammation diminished promptly and that complete resolution occurred in a period varying from three to five days. The remaining 8 cases, in which localization had taken place, showed satisfactory but less striking results. In this group as in the preceding one, the peripheral blood showed fewer inflammatory modifications than the peripheral blood. In fact the general leucocytosis was in all cases less than in Group I, while the peripheral leucopenia was less marked. With reference to qualitative changes in the inflammatory area, the lymphocytes offered the most significant clue. After the first or second injection an increase in these was almost constantly observed, a modification closely paralleled by the monocytes, and later interpreted by the author as the final phase in the reaction of inflammation and, hence, as an index of prompt healing.

In the third group attention was directed to possible modifications of the tissue pH by the infiltration of acid or neutral novocaine. (The resultant effect upon the virulence of the invading organisms.) It was observed that both of these solutions tended to convert an eructate in all cases acid, to a pH above 7. Since the curve of acidity closely follows the clinical course it is believed that the modification of that factor by novocaine might be the mechanism by which improvement with that method was obtained. More specifically it has been demonstrated that the pain of such lesions is a direct function of the acidity and that the anesthetic value of the novocaine is due to that factor.

EDITH FAIRB, DENT, M.D.

Hagenmaier, A. Local Tetanus in Human Beings (*Ueber den lokalen Tetanus beim Menschen*) *Erlangen Dissertation*, 1919

The difference between local and general tetanus was recognized as early as 1663 by Guy de Chauliac, as well as by Larrey the great army surgeon of Napoleon. During recent times, cases are reported by various authors, but they are not numerous. Experiments with white mice demonstrated typical results.

Injecting lethal dose of tetanus subcutaneously on one side of the mouse, from the shoulder to the hip.

With long needle results in an immediate unilateral tonic spasm on the side injected. After the poison diffuses from the spinal marrow on the side injected to the opposite side the tetanic rigidity becomes bilateral, then proceeds to generalized tetanic cramps, and ends in death—result of diaphragm.

also, because an albumin-minus serum was administered (FRA.) M. THOMAS J. SECRETARY M.D.

Jaeger: P. Tetanus Prophylaxis or Not? (Tetanus prophylaxis oder nicht?) *Muenchen. med. Wchnsch.* 1936, 64.

This question of using tetanus prophylaxis or not is so urgent that it was selected as a subject for the next International Congress on traumatic surgery. By inquiries to general practitioners it had been learned that a large percentage of them do not give prophylactic anti-tetanus injections and do not believe in their effectiveness. It is interesting that Illingworth 1927 received positive answers as to the regular use of tetanus prophylaxis in 93 per cent of the cases of soiled wounds. He also stated that the mortality was 76 per cent in the prophylactic era, while later it mounted to only 5 per cent. Mosbacher figured a mortality of 8 per cent in tetanus cases that had received injection treatment within the first twelve hours after injury, while it was 37 per cent in those injected later. Franks said in his *Military Surgery* that with the introduction of general prophylaxis, the tetanus in the armies of the World War almost disappeared. This means for the German army that about 9,000 injured men were saved from tetanus.

The anti-tetanus prophylaxis was favored in the replies to a questionnaire sent in 1931 to the heads of the German surgical university clinics. Jaeger quotes some of the answers. The reappearance of doubts is due to the fact that the wound excision according to Friedrich has increasingly come into general usage, and its users believe it to be able to renounce anti-tetanus prophylaxis. The author proves conclusively that this conception is erroneous. Many surgeons do not differentiate clearly between wound excision (Friedrich) and surgical wound toilet (von Bergmann). Heiler, one of Friedrich's pupils, recently stressed this difference. Wound excision means excision of the whole wound. If it is carried out within the first six hours, one may assume that the wound and the germs which at this time are still superficial and have not penetrated into the depth have been removed, the tetanus germs included. Serum prophylaxis then is superfluous. However, unfortunately only comparatively few and superficial wounds can be excised late. If wound is excised after six hours, or only cleaned surgically, bacteria have already penetrated into the depths, and the wound is no longer free of bacteria. It is just the faulty intermingling of these two measures which produces the so frequent serious complications after primary wound suturing. A wound which was cleaned only surgically must, as also Friedrich demanded, remain open. If excision after the time limit established by experience has been done and the wound has been sutured, it should be drained. Furthermore, one must keep in mind that there are wound infections in which the discussed time limits cannot be applied, such as laboratory injuries with bacterial cultures, injuries in the operating room,

fishbone injuries, and bites. In these cases also early total wound excision avails nothing and one must never attempt primary closure. Thus, the Munich Clinic does not give prophylactic anti-tetanus injections when they can totally excise and thus sterilize common accidental wounds quite early. In all other cases, they give the prophylaxis as early as possible, possibly within the first six hours, and after this time has elapsed, they give 3 or 5 times the usual dose, and furthermore, as the protection lasts only twelve days, they repeat the injection in cases of prolonged wound healing.

The author objects strongly to consulting the general practitioner on this question. The clinics do not treat only hospitalized patients, but their out-patient departments take care of an enormous number of injuries, the likelihood of which the general practitioner never gets a chance to see. The Munich Poliklinik (out-patient department of the surgical university clinic) in the last ten years has treated 40,000 fresh injuries and none of the patients who there had received proper anti-tetanus prophylaxis developed tetanus. On the other hand, during the same time patients with tetanus were hospitalized; they had not had proper anti-tetanus prophylaxis. The Munich Clinic has seen only one case of erythema of the plexus brachialis as a complication of the prophylaxis; the condition healed within three months.

Ehrlh protests from Boehler's Clinic that they rely so strongly on their prophylactic wound excision that they will renounce prophylactic tetanus antitoxin injections. The author believes this policy to be risky. Besides, this clinic still used the prophylaxis in 55 (.8 per cent) of 2 cases of wound excision, and in 35 (14 per cent) of 2, 29 cases of severed skin. Furthermore, it is certain that in 7 cases treated there primarily tetanus did develop. 6 of these had not had prophylaxis. Boehler himself says that as not every wound can be excised, serum prophylaxis has to be used in cases of soiled wounds in territories where tetanus occurs. As to the physician liability, the author stresses that the doctor cannot be blamed if the primary wound treatment has been carried out according to the established rules. The author expressly refers to a paper of Franz in *Der Chirurg* which concurs with his opinion. (F. 1933) HEDENRUBEN LANK, M.D.

Lawrence, K. B. Sulfanilamide Therapy in Chronic Undermining Streptococcal Ulcer. *Brit. Med. J.* 1936, 373.

The author describes the case of a fifteen-year-old school girl who had sustained a floor burn in the school gymnasium, the affected area being just below the knee on the anterolateral aspect of the leg. An ulcer formed which at various times assumed various forms of treatment for two months. Daktin solution, simple saline dressings and diathermy treatment, all seemed effective in cleaning the wound at times, even promoting a degree of healing. Exacerbation of the ulcer activity then invariably

occurred. Zinc peroxide at first appeared even more effective. When, however, an attempt was made to pinch off the clean ulcer base, the grafts promptly loosened and the ulcer again became active. Zinc peroxide paste was ineffective when tried on three subsequent occasions. This failure may well have been due to the inferior oxygen liberating power of the material available. The complicating organism, bacillus pyocyaneus present in the ulcer, thus may also have had some influence. Any therapy is entirely ineffective.

After the initial treatment period, two months, the ulcer is only a little smaller than on admission. There is less undermining, but the granulation of the base is still heavily infected. Sulfanilamide treatment began at that time, and control of the inflammation proved satisfactory. By the third month, however, was lost, perhaps because of the fact that sulfanilamide may exert a beneficial effect on wound healing. The presence of toxemia from the sulfanilamide, reflected by a significant drop in the red cell count, also added to the total healing time. Re-appointment of the drug, on each occasion demonstrated convincingly its prompt effect on the inflammatory process.

It is rarely necessary to administer sulfanilamide in such high total dosage (5,400 gr.) for so prolonged a period (four months). When one recalls the toxic side-effects of this drug, this case is of some importance in indicating the quantities which can be administered safely to a patient with peptic and duodenal ulcer. Moderate reduction in the red cell count and a slightly diminished renal function during the treatment period were the only significant toxic effects. Three months later a check up of the peripheral blood picture and the renal and hepatic function by standard methods showed normal findings.

Despite daily dosages of 100 gr. of sulfanilamide for long periods, it was never possible to raise the blood serum level above 3.3 mgm. per 100 ccm. The low serum sulfanilamide level may have accounted in part for the absence of any additional effects.

Approximately 60 gr. of sulfanilamide daily was required to maintain the ulcer in a healing phase with a dosage of from 50 to 100 gr. (or 3 mgm. per 100 ccm. serum level) as a therapeutic dose. Daily dosage of 100 gr. for 7-hour periods in the case resulted in no additional improvement in the healing and gave the patient no major and mild symptoms. There was no febrile reaction on resumption of the sulfanilamide in full dose after a rest period of at least 48 hours. The patient experienced no reaction after any of the four transfusions nor a therapeutic effect from a simultaneous administration of ferrous sulfate and the sulfanilamide over fairly long periods.

No micro-organisms, including streptococci, were recovered from the ulcer. The strain was beta hemolytic and occurred to grow well in air. In a culture 2 per cent of streptococcus viridans was identified after period of both zinc peroxide and sulfanilamide treatment. Clinically, however, the ulcer resembled the type described inadequately by Meloney from which he is able to add to micro-organisms only. The admittedly good control of the ulcer activity obtained by the first and potent lot of zinc peroxide seem to justify further the classification of this ulcer with Meloney's group.

A combination of zinc peroxide dressing when a more constant potent product can be developed and sulfanilamide administered systemically, may well prove the ideal treatment for this serious disease.

SAMUEL H. KATZ, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Rodrigues, A., and Carvalho, R. Roentgen Kymography in the Study of the Respiration (La roentgenkymographie dans l'étude de la cinétique respiratoire) *Arch. méd.-chir. de l'emp. russe* 939 4 24.

Kymographic studies are reported of the movements of the diaphragm and of the thoracic cage following section, and after alcoholic injection of the phrenic nerves, laterally and bilaterally and following alcoholic injection of the intercostal nerves. Movements in artificial pneumothorax are also recorded.

According to the authors the superior lobes of the lungs are immobilized by injection of the intercostal nerves, whereas there is a compensatory increase in mobility of the inferior lobes. Just the reverse of this condition follows section or injection of the phrenic nerve.

These observations suggest that roentgen kymography may have valuable application in collapse therapy of the lungs, not only in planning the details of treatment but also in checking its effectiveness. STEWART E. JOHNSON, M.D.

Guardabassi, L. The Contribution of Pyelography to the Diagnosis of Extrarenal Abdominal Tumors (Contributo della iodopneumografia alla diagnosi di tumori addominali extrarenali) *Radiol. med.* 940, 7 24.

Guardabassi states that roentgen examination of the empty abdomen may in some cases give interesting information concerning the location and form of the kidney but examination must always be completed by pyelography. The descending or the retrograde method, or both, should be used, the choice depending on the case. However retrograde pyelography presents the advantage of giving the clearest pictures and is absolutely indicated in the presence of pararenal tumor because the other method frequently gives no picture of the pelvis and ureter in cases of this type. The author describes the topographic, morphological, and functional changes of the kidneys and ureters caused by extrarenal abdominal tumors, reported in the literature, and reviews briefly 27 personal cases in which he has used pyelography.

His observations confirm the fact that descending pyelography usually does not give any picture of the urinary passages on the side on which the abdominal tumor extends most; retrograde pyelography only can then give the required information on the anatomical condition of the involved organ. However the two methods must be considered as complementing one another. Two of his cases showed that the renal changes are reversible by roentgen therapy. There are no changes in the location and form of the urinary passages which are more or less

characteristic for one or another tumor; aneurysm of the aorta may cause the same displacements as a tumor of the lumbo-aortic lymph nodes or extra renal hypernephroma. Among the author's cases, there were 5 retroperitoneal tumors. There was more or less marked displacement of the kidney and ureter in 8 cases, while morphological or functional changes were noted in 6, and it is logical to think that displacements could have been found in some of the latter cases if retrograde pyelography had been used. Consequently retroperitoneal tumors nearly always cause changes in the location or at least the form of the urinary passages. On the other hand, Foerster has claimed that there is always a pyelo-ureteral congenital dystopia in endoperitoneal tumors which are accompanied by renal displacement. This is not always true because the roentgen criterion to determine whether pyelo-ureteral ectopia is congenital or not rests on the demonstrable length or shortness of the ureter. This criterion may lead to false interpretations because the following two basic factors are not taken into account: (1) descending pyelography gives no result in renal compression and (2) unless special precautions are used, retrograde pyelography does not show the exact length of the ureter but only the length of the opaque catheter which straightens small curves and reaches the pelvis by the shortest route. The author's cases show that the renal pelvis and ureter are only rarely displaced by endoperitoneal tumors; on the other hand, these cases often present a change in the renal function revealed especially by more or less marked pyelo-ectasia.

RICHARD KRIEGER, M.D.

Parola, G. Dystrophic Abdominal Calcifications Not Located in the Cavities of the Abdomen (Calcificazioni addominali distrofiche non cavitarie) *Radiol. med.* 940, 27 97.

Parola discusses only the dystrophic calcifications of the abdomen encountered in the parenchyma of an organ or in pathological tissues.

Peritoneal calcifications present such variations in localization and form that they cannot be classified; besides, they may simulate calculi belonging to various organs. They may represent remnants of tuberculous peritonitis (the opacity of the granules is greater at their center), irregular multiple and mobile epiploic incrustations, meconium concretions, round eggs of parasites, particles of echinococci, calcified echinococci or of regular renal contour and any one of real peritoneal calculi, his opaque uel separated by more transparent and irregular spaces, and meconitic cysts which are recognized by their spherical form and stratification.

Calcified lymph nodes are most frequently meconitic or retroperitoneal, isolated, small, round, or irregular, and present an opacity similar to that of

bone They may be mesocolic, gastric, hepatic, or splenopancreatic. Lateral exposure is recommended for their recognition and they must be differentiated from renal calculi and calculi of the urinary passages.

Phleboliths occur in almost one-third of the adults, they are from 2 to 5 mm thick and increase in length with the age of the patient, their density is that of bone cortex, their contour is well defined, and they are placed in a row. They are found in the pelvis usually at the level of the ischiatic spine or along the upper border of the pubis, they are symmetrical and bilateral, roundish or oval, and have a more opaque center. They may be found along the ureters and must be differentiated from ureteral calculi which are located more cranial than the phleboliths.

Calcification of the arteries is easily recognized by its cylindrical shadow with double contour, slightly waving course, and more opaque patches due to large calcified plaques. According to the degree of calcification, the artery may appear as a cord with linear margins or as a homogenous streak, it may present granulations or rings. Arteriography is useful to study calcification and avoid confusion. Calcification of aneurysms of the aorta is more or less regularly annular and found in concentric layers, that of the renal arteries is rare.

The calcifications of the digestive tract include enteroliths which are found especially in the colon and the appendix and at times in diverticula of the intestinal wall. They are round, cylindrical, or oval and are formed around a nucleus of varying extraneous material. The opaque meal is useful for their recognition. Tuberculous processes and tumors of the intestine and also the wall of the stomach may be calcified.

Calcification of the hepatic parenchyma is rare. Calculus of the intrahepatic biliary tract must be excluded by its lack of homogenous appearance, but the differential diagnosis is difficult and is usually made at necropsy. Phleboliths and calcified echinococcus cysts, larvae of pentastoma denticulatum (picture similar to that of phleboliths) or wall of the gall bladder may be encountered. Calcifications in the spleen are still rarer. Anterior, posterior, and lateral exposures are needed with verification of the mobility of the shadow with that of the spleen, stereography, pneumoperitoneum, and splenography are useful. When the calcification is located in the hypochondrium, that of the costal cartilages must be excluded.

Calcifications found in the pancreas are usually calculi, they are located on an oblique line from left to right and from above downward between the twelfth dorsal vertebra and the second lumbar vertebra.

Renal calcification may be due to nephrolithiasis, tuberculosis, abscess, tumors, mercury-bichloride poisoning, cysts, pseudocysts, and parasites. The possibility of retention of opaque substance must be considered and perirenal calcifications must be differentiated. Roentgen examination should be completed with pyelography.

Suprarenal calcification is usually due to tuberculosis, rarely to Addison's disease. Small, semilunar opacities are found at the side of the spine above the kidney region.

Calcification of the ureter resembles that of the veins, but has no specific characters.

In the bladder, the mucosa may present calcifications in cases of tuberculosis, abscess, or toxic necrosis. Among the parasites, schistosoma hematobium is most frequently calcified and found especially at the trigonum and ureteral orifices, the wall of the bladder infiltrated by calcified eggs may give a dense, massive shadow. Calculi are differentiated from bilharziasis by their form and distinct contours. Pyelography and cystography are indicated.

In men, calcifications may be found in the prostate, seminal vesicles, and deferent ducts. Prostatic calculi are rare, they are usually multiple, round, and bilateral on the median line about 2 or 3 cm above the symphysis.

In women, calcification may occur in the ovaries (dermoid cysts must be remembered), the tubes (especially in pyosalpinx), and the uterus (retention cysts, granulomatous tissues, and tumors). The only calcifications demonstrable by roentgen examination are those of fibromyomas.

RICHARD KEMEL, M D

Bell, J. C. Some Uses of the Spot Film in the Roentgen-Ray Examination of the Gastro-Intestinal Tract. *Radiology*, 1940, 34 469

Bell states that the spot film supplements but does not replace films made in the usual manner. When spot films are indicated by the fluoroscopic findings, he routinely makes a film in the right postero-anterior oblique position, with the patient supine and rotated toward the left, this is of value in showing the fundus of the stomach filled with opaque material, and usually gives an excellent double contrast view of the mucosa of the distal two thirds of the stomach and the duodenal cap. A second film is made in the left postero-anterior oblique or direct lateral position with the patient horizontal, this is helpful in determining which wall of the duodenum is involved when ulceration is present. In most cases, serial films, usually eight in number are then made in the right postero-anterior oblique position with the patient prone, these usually show the distal two thirds of the stomach and the duodenum but may be taken to show other portions of the gastro intestinal tract. In addition, many other films may be made with the patient either upright or horizontal, when indicated by the fluoroscopic findings.

Of the lesions commonly found in the esophagus, only the diverticulum and the ulcer can be demonstrated to advantage by this type of film. The mucosal relief of the stomach may be well shown, posterior-wall ulcers away from the curvature may be demonstrated, and the mucosa about the base of an ulcer may be visualized. Early carcinomas, polyps, and small benign tumors may be demon-

strated. The author states that the spot film has proved to be of greatest value in demonstrating the niche in duodenal ulcers, when shown it is regarded as positive proof of ulceration, past or present. He considers the spot film excellent for recording duodenal diverticula, benign tumors of the duodenum, and other lesions in this area. Also he believes it ideal for demonstrating a marginal ulcer in the stomach of gastrojejunostomy or jejunal ulcer. Many lesions of the small intestine and colon may be shown to advantage by the spot film.

It is the author's opinion that the spot film should become an important adjunct to the film technique in many roentgen ray examinations of the gastrointestinal tract and gall bladder.

EARL GUNSON, M.D.

Bignami, C.: Reactions and Local and General Changes Caused by Roentgen Therapy With 350 Kilovolts (Roentgen and alternative local generally da roentgentherapie 350 kv) *Radiol. med.*, 1940, 27, 27

Bignami made a comparative study of the reactions and the local and general changes observed in roentgen treatment with 170 and 350 kv respectively. He used 57 patients with carcinoma of the prostate, who all were in about the same condition at the time the treatment was started. The age of the patient varied between forty and sixty years. Each patient was first given radium treatment with from 40 to 50 mgm. of radium in tubes of from 5 to 10 mm. filtered with or made of platinum and introduced into the cervical canal and the vaginal fornices. A total dose of from 35 to 60 destroyed millieuries was given in from seven to nine days. One and one-half months later the roentgen treatment of the pelvis was instituted through two portals, a hypogastric and a sacral one. Each portal received 3,000 roentgens in fractions of 50 roentgens per day. Ten sittings were used each day so as to give the total dose of 6,000 roentgens in twenty days.

Comparison of the results obtained in the patients treated with 350 kv and with 170 kv respectively showed:

The cutaneous lesions caused by gamma roentgen therapy were all of lesser importance and duration when the same doses were used. Nearly complete repair occurred within three months and returned to normal, at least from the esthetic point of view within six to twelve months.

The behavior of the intestinal disturbances and of the radiation disease was practically the same for the two methods.

3. Gamma roentgen therapy exerted more damaging action on the weight of the body and, to a minimal degree, on the arterial tension. The decrease in weight was greater and lasted longer and its final recovery was slower.

To these results must be added those of the author's previous investigations on the changes of the blood, which it was shown that gamma roent-

gen therapy causes less increase in the coagulability, time less decrease in the globular reactivity and similar or even less serious changes in the blood picture than those observed after treatment with x-rays. Therefore, it is advisable to give the preference to gamma roentgen therapy for the treatment of numerous disorders especially if they are deeply located and consequently require the use of very high doses.

RUSSO KNOX, M.D.

Porta, R.: The Results of Roentgen Therapy in Malignant Lymphogranulomatosis (Krebs lymphogranulomatosis maligna) *Arch. intern. med.* 1940, 1, 69.

The author reports on 70 cases of malignant lymphogranulomatosis treated and followed up in the period from 1927 to 1937. In practically all the cases diagnosis was confirmed by biopsy. The cases were classified as follows: (1) glandular forms—(a) peripheral localization (8), (b) multiregional peripheral localization—cervico-aortic (lingual)—(11), (c) abdominal (5), (d) mediastinal (6), (e) combined mediastinal and peripheral (4), (2) extra-lymph-gland forms—splenic (1), hepato-splenic (6), and (3) generalized lymphatic form with visceral localization (8). These distinctions are made on the clinical manifestations when the patient first reported. However later in the course the reticulo endothelium everywhere became involved, with particular emphasis on the lymph glands. The more rare localizations are grouped as follows: (1) osteoperiosteal (4), (2) pleuropulmonary (6), (3) cutaneous (7), (4) serous (5). The most common localization was the peripheral glandular, either single or multiregional, and this group was most readily diagnosed. The most difficult to diagnose was the mediastinal type, only 6 of 9 such cases were diagnosed early before the invasion of the peripheral glands and other organs. X-ray examination is most valuable in mediastinal cases. Some of these cases may be confused with dilated aorta. The author describes in some detail the clinical manifestations of the rarer types of localization in the bones, abdomen, lungs, nervous system, and skin.

Hematological examination in these cases indicated leucocytosis from 10,000 to 20,000, with times an eosinophilia and moderate monocytosis. In the early stages there was no reduction of the erythrocytes or hemoglobin.

As to the clinical course the author found three types: (1) acute course of typhoid form (1), (2) subacute course (50), and (3) chronic course (1).

Radiotherapy is the method of choice in treating malignant lymphogranuloma and the x-rays are the *ally medium* which exert favorable effect on the course of the disease. The action of the rays is direct and rapid on the granulomatous tissue, which becomes sclerotic, and the lymphatic trunks are destroyed and replaced by connective tissue. Early cases in the stage of lymphoid hyperplasia are most sensitive to the influence of the rays. This indicates the necessity of early roentgen therapy.



Fig 1 Mediastinum at beginning of treatment



Fig 2 Same patient as in Figure 1 after two courses of radiation therapy. Patient lived four and one half years after the beginning of treatment

Within seven or ten days after roentgen therapy the masses of granulomatous tissue begin to shrink. With improvement of the local condition there is also a general improvement of the patient. Fever drops, mediastinal pressure symptoms disappear, the blood improves, and one gets the impression that the morbid process is cured. However, the x-rays only induce a remission in the progress of the ailment. The duration of life depends on individual variations and factors such as the clinical type, the stage of the disease in which roentgen therapy was begun, and the special localizations of the morbid process. The acute forms are not susceptible to roentgen therapy and are even aggravated by the latter. The course is usually from three to six months. The author's only patient with an acute condition died after a course of four months and the author was under the impression that the roent-

gen therapy aggravated the condition. In subacute types the patients have survived from two to three years. In the chronic type they have survived from four to six years. As to localization, the most serious as to the duration of life are the pulmonary and the hepatic types. X-rays prolong the life of these patients (see Figs 1 and 2).

As to the technique of roentgen therapy, the author exposes each focus to from 500 to 600 roentgens fractionated according to the sensibility of the patient. For mediastinal irradiation he uses two large fields anteriorly and posteriorly (15 by 15 or 20 by 20). In mediastinal cases small doses which are gradually increased are advised in order to avoid severe reaction. The author uses 160 kv, filters of copper (0.5) plus aluminum (1.0) at a distance of from 30 to 50 cm.

JACOB E. KLEIN, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Maggi, N. A Contribution to the Knowledge of Spontaneous Juvenile Gangrene Attempts at Treatment with the Female Sexual Hormones (Contributo alla conoscenza della gangrena spontanea giovanile. Tentativi di trattamento con gli ormoni sessuali femminili). *Arch. Ital. di chir.* 1939, 57, 4.

Maggi presents some arguments in favor of the suprarenal theory of the pathogenesis of spontaneous juvenile gangrene and shows that some of the objections raised recently against this theory cannot be accepted. He insists on the importance of the constitutional endocrine factors in the determination of the disorder and especially on the congenital idiopragia of the vascular system. The results of his previous studies and those obtained by other authors led him to treat with injections of folliculin 9 patients suffering from spontaneous juvenile gangrene. He used commercial preparations, especially progynon B in ampoules of 1 c.cm. containing 0.0001 I. U. and ovocyclin in ampoules of 1 c.cm. containing .000 and 20,000 I. U. of folliculin. In isolated cases, he injected estralase which contains only 50 I. U. of folliculin per cubic centimeter. During the entire period of observation, he has not seen any serious incidents. In case, the administration of a rather high dose (30,000 units) caused sudden activity of the breasts and temporary aggravation of pain, which disappeared promptly on suspension of the treatment and did not return when smaller doses were used subsequently. In another case that had been greatly improved with verage (.000 I. U.) and small (50 I. U.) doses, the administration of higher doses caused, for some unknown reason, sudden aggravation of the process which required immediate amputation. This patient had been ill for seven years and had been admitted with condition of the foot which indicated prompt amputation, but had been improved so much by the folliculin treatment that the amputation could be deferred for several months. No decrease in libido and no involution of the testicles was noted in the patients.

In general, the subjective symptoms and the objective course of the disease are decidedly improved and the process has not recurred up to the present time. There is marked remission of the pains usually after from 4 to 6 injections they gradually decreased in intensity and frequency and the cramps in the calves disappeared last. Frequently the patients reported the appearance of perspiration few hours after and even before the injection, associated with an agreeable feeling of warmth over the entire body and especially in the involved parts. The ulcerations which had been present for long time and had resisted all treatment were healed from one and one half to two months.

The oedilometric index was studied in the four extremities and in the two parts of each extremity in all patients. In general, there was an increase in the index accompanied totally by decrease of the pressure values in those extremities which were most strongly involved by the process, generally the lower ones and particularly the legs. On the other hand, the index remained unchanged or was decreased in the proximal parts of the extremities and especially in the arms. It would seem that, in the presence of a vasodilating action of the female sexual hormones, the behavior of the anatomically healthy arterial segments which are more or less contracted differs from that of the segments in which the importance of the spasm has been reduced to second place by the presence of anatomical lesions when the vessel is intact, vasodilating indices, with a slight fall of the pressure, a slight impulse of the blood wave on the vascular wall and therefore a decrease in the oedilographic values when the vessel is strongly altered, the suppression of the spasm allows full play to the minimum of permeability which the vessel still possesses and permits the blood wave to transmit the impulse to the vascular wall, even if only weakly. However it should not be thought that completely obliterated vessels, in which the oedilometric index is zero, can still be influenced by the treatment and can be recanalized. Improvement in these cases must be attributed to the vasodilating action of the hormones on collateral vessels which are still in good anatomical condition. This fact is proved by the abrupt changes in the oedilometric index.

RICHARD KERN, M.D.

Sheehan, H. L. The Pathology of Acute Yellow Atrophy and Delayed Chloroform Poisoning. *J. Obst. & Gynec. Brit. Emp.* 1940, 47, 49.

True acute yellow atrophy is very rare in pregnancy. Among Bergstrand 7 cases there was none in a pregnant patient and in the last 400 post-mortem examinations on pregnant or puerperal women in the Glasgow Royal Maternity Hospital there has not been a single example. It could appear that true yellow atrophy of the liver is so uncommon in pregnancy that it can be looked upon only as a chance complication.

Obstetrical acute yellow atrophy appears to be a definite entity. Clinically it is very similar to true acute yellow atrophy but the pathology is sufficiently distinctive to make differentiation of the two diseases. Sheehan's description is based on 6 cases found in the last 400 obstetrical post-mortem examinations.

At top the patient is deeply jaundiced. The liver is yellow and rather small. Its lobular pattern is not lost. Microscopically all the cases show an identical lesion there is gross fatty change affecting the entire lobule except sharply defined rim of

normal cells around the portal tracts. The affected cells were blotted by a fine form of tiny fatty vacuoles throughout the cytoplasm. The nuclei were normal, and there was an entire absence of necrobiotic change. The liver lesion does not show any histological similarity to true acute yellow atrophy, there is an entire absence of necrosis in the obstetrical cases.

The cause of the disease is not known. Clinically, the condition has to be differentiated from true acute yellow atrophy, toxic necrosis of the liver by chloroform, atophan, salvarsan, or phosphorus, catarrhal jaundice, and cholelithiasis.

Delayed chloroform poisoning appears to be much more common in obstetrical than in other types of patients. Fourteen cases were found in the last 400 post-mortem examinations. Pathologically, they may be divided into three groups, each with a fairly constant clinical basis.

In the isolated cell lesion group, the result appeared to be due to an overdose of chloroform in a healthy subject. Microscopically there was a lesion with a peculiar affinity for certain individual cells in the liver columns, leaving quite untouched other cells between the damaged ones. The affected cells were about twice the normal diameter and ballooned to a spherical shape, they had a clear non fatty cytoplasm and a tiny pyknotic nucleus. The 2 patients in this group died of conditions unrelated to the anesthetic, and neither had any evidence of hepatic insufficiency, if they had recovered, the lesion could presumably have been repaired by regeneration within a few days.

The mid-zonal necrosis group is the most common type of lesion in obstetrics and 9 examples were seen in this study. All of the patients had a prolonged labor before administration of the chloroform. Microscopically, the essential lesion was a mid zonal necrosis which was quite universal but varied in severity from place to place. Four of the patients had endometrial sepsis, and 2 of these had also an early general peritonitis. There is no evidence that the sepsis played any part in the production of the liver lesions.

Two cases of the central necrosis group were seen. Each of the patients had hyperemesis, had aborted under chloroform without the preliminary intravenous administration of glucose, and died three or four days later. Microscopically, the central zone and the inner part of the midzone of the liver were completely necrosed, the outer half of the midzone showed a definite fatty change but appeared viable, and the perportal zone was intact.

Delayed chloroform poisoning is almost entirely confined to patients who have a gross metabolic disturbance before the administration of the anesthetic. The factor of a starvation acidosis appears to be common to all cases. It is to be emphasized that the patient who has been left in labor for a few days without adequate treatment is extremely susceptible to what may be regarded rather as a poisoning by delayed chloroform than as a delayed poisoning by

chloroform. Repetition of chloroform anesthesia after an interval of a day or two may lead to damage if the patient has been allowed to develop acidosis after the first anesthesia. CHARLES BARON, M.D.

Leriche, R., and Jung, A. What is a Callus? (*Qu'est-ce qu'un cal?*) *J. de chir.*, 1940, 55, 193.

Leriche and Jung note that new bone formation of the same type as that found in callus occurs in forms of injury involving tissues near a bone without injury to the bone itself. In luxation or sprain without fracture there is formation of new bone in the muscles or ligaments at the site of the injury. The new bone formation that has been given the name of callus does not result from fracture *per se*, but from trauma, it is but one form of post-traumatic osteogenesis. In fracture, there is typically a decalcification of the injured bone which may extend much beyond the limit of the injury and may become widely generalized, this decalcification supplies the mineral elements for the formation of the callus. However, similar decalcification, sometimes generalized, may occur after a simple sprain or luxation. The new bone formation that has been called callus in fracture does in many cases take part in the healing of the fracture and the reparation of the bone, it is true, but, on the other hand, there may be new bone formation of a similar type around the fragments in ununited fractures. Such new bone formation and the new bone formation in luxations and sprains which play no part in reparative processes do not differ in their essential characteristics from the new bone formation that aids in the repair of fracture. They are all due to various modifications in the connective tissue produced by post-traumatic vasomotor disturbances. So-called callus is not primarily a reparative process, it is a pathological process of the same type as para-articular ossification in sprains and muscular osteoma in luxations. This new bone formation and the accompanying decalcification in fracture may be considered as a "biological disease" of fracture.

ALICE M. MEYERS

Borghetti, U. The Relation between Epulis, Myeloma, and Osteodystrophy (*Sui rapporti tra epulidi, tumori a mieloplasia e osteodistrofie*) *Tumori*, 1940, 26, 1.

The author agrees with Morpurgo that there are many neoplasms which are difficult to classify oncologically. Among these are cheloids, desmoids, dermatofibromas, epulis, and giant-cell tumors. A brief discussion of these difficulties is presented.

The author refers to epulis as the classical giant-cell type of tumor. He then reviews some of the hypotheses regarding its origin. Barbacci and others believe that epulis is of true blastomatous nature. Hellner and others have tried to associate the giant-cell epulis with the form of bone dystrophy localized to the maxilla. Recklinghausen was the first to identify the giant-cell epulis with the brown tumors of osteitis fibrosa. Arlotta reported a case of multiple

epulis in which it was determined that the growths were external manifestations of the osteitis fibrosa involving the mandible. The author is of the opinion that giant-cell tumors of the skeleton have the same essential characteristic as the epulis, i.e., the contrast between histological signs of malignancy and a benign clinical course. Whereas some authors make distinction between the more common type of benign giant-cell tumor and the exceptional malignant form others consider giant-cell tumors as true blastomas and do not distinguish benign and malignant variety with the possibility of the former developing into the latter.

The author then reports a case of epulis and multiple myeloma developing during pregnancy in a thirty-eight year-old female. The patient first noticed in her sixth month of pregnancy a small tumor arising on the gum between the right lower second premolar and first molar teeth. It was associated with no pain but gradually increased in size to that of a hazel-nut. Under local novocaine anesthesia the two teeth bordering the tumor were extracted and the tumor was excised with the cautery. Histological examination revealed typical giant cells characteristic of epulis. The patient was then treated with radium and discharged as cured. Sixteen months later she returned complaining of two tumor masses over the crest of the right tibia, which she first noticed several days after her discharge from the clinic and which had gradually increased in size. Aspiration biopsy was done and histological examination revealed characteristic giant cells similar to those present in the epulis. Thus as subsequently verified by surgically removed sections of the tumor. Roentgenological studies of the skeleton revealed multiple circumscribed areas of bony rarefaction in both tibiae and ulnae, the right acromion, left ilium, left twelfth rib and cranium. The histological and roentgenological appearance is illustrated.

The author then discusses the difficulties of classifying this case and concludes that it is an example of the possible transformation of the localized form of giant-cell tumors (epulis, solitary giant-cell tumors) into the generalized type.

MICHAEL DEBACZY, M.D.

Prates, M. A Study on Carcinomas Deriving from the Skin (Contribuição para o estudo dos carcinomas derivados da parede do quisto epidermóide). *Arq. de Bot.,* 1939, 435.

The exact origin of neoplasms of the skin is not always clear as the tumors may arise from the epithelium, sudoriferous glands, sebaceous glands or dermal or epidermal cysts.

In instances the author is able to demonstrate the origin of cancer of the skin from epidermoid cysts. Although only a few similar cases have been published, this type of carcinoma does not appear to be rare. The occurrence of this particular type of cancer is an example of the grave consequences which may follow neglectful treatment of the original condition, or treatment at all.

One of the cancers observed by the author was located on the upper lip and the other in the temporal region. Only an extirpation of the tumor during the early stages of the condition allows a demonstration of its exact origin.

According to the author's opinion malignant degeneration is due in the majority of cases to prolonged irritation of malformation. A cancer of this type may also develop from a fistula originating in the remaining portion of the cyst after an incomplete excision. In the 2 cases mentioned probably the first mode of origin prevailed.

JOSEPH K. VAX, M.D.

Gilchrist, R. K. Fundamental Factors Governing the Lymphatic Spread of Carcinoma. *Ann. Surg.* 1940, 630.

A very careful study of the lymph-node metastases in 74 operative specimens of carcinoma of the rectum and colon was made. Full-scale dissections of cleared specimens were made, with the arterial tree and the exact location of the lymph nodes in relation to the tumor and arteries. Three hundred and sixty-four of these nodes contained carcinoma metastases. In addition, 65 microscopic sections of lymph nodes were studied in a similar fashion in operative specimens of carcinoma of the breast. There were 13 of these nodes which contained metastases.

Study of this surgical material brought out the following facts:

Penetration of carcinoma through lymph channels was seen only when the lymph node central to the channel involved was already blocked with carcinoma.

2. Carcinoma metastases do not completely destroy the function of a node until all of the node is destroyed. This as shown in surgical specimens of carcinoma of the breast. The lymph channels in the neighborhood of the tumor were injected with a suspension of carbon particles. The specimen was cleared and some of the lymph channels and several lymph nodes were seen to be outlined in black. This section showed how the suspension could still flow into a node which contained large metastases. Most of the carbon was found in the normal part of the node although some of it penetrated short distance along spaces between the cancer cells.

3. Forty-four of the 364 carcinomatous nodes contained metastases limited to the subcapsular space just beneath the capsule. In 30 of the 364 involved nodes the lymphoid tissue was completely replaced by carcinoma.

4. Throughout the entire series a common pattern of lymph-node metastasis was seen. When the metastasis had grown larger than the small subcapsular lesion, the spread was by expansion around the subcapsular space and into the depth of the node. This was usually accompanied by a thickening of the capsule especially over the area adjacent to the growth. There was sometimes more or less heavy layer of fibrous tissue between the cancer cells and the lymph cells. In many cases there was so much

interference with nutrition that a thick layer of fibrous tissue was seen, a thin rim of live cancer cells was within this, and necrosis was in the center. Growth progressed until one or several large nodes were seen, these usually lay close to the main blood vessels, in which the lymphoid tissue was completely replaced by carcinoma. Groups of lymph nodes which were completely replaced by metastases were found in certain regions. In specimens of carcinoma of the rectum and lower sigmoid such nodes were usually located near the bifurcation of the superior hemorrhoidal artery (Fig 1). In carcinoma of the breast, nodes about 1 in. below the brachial vein and along the lateral edge or just behind the pectoralis minor muscle were the ones most likely to be completely replaced by carcinoma. The group of heavily involved nodes was along the main or primary line of lymph drainage. Nodes involved below or lateral to these nodes were apt to be subcapsular lesions or lesions which were obviously late metastases.

5 In no case had there been any evidence of penetration of carcinoma outside of the capsule of any node, except where there was a collection of large involved nodes lying tightly packed together. In 7 of the 9 cases in which this occurred, the superior hemorrhoidal artery or the main artery supplying the region of the nodes was blocked by pressure of the nodes. Several of these nodes contained necrotic material.

6 In 6 cases, retrograde metastasis of the lymph nodes was found below carcinomas of the bowel or rectum. In every one of these enough of the nodes

central to the lesion were completely replaced by carcinoma to suggest definitely that there was a very marked obstruction to the lymph flow and the metastasis occurred by retrograde means.

7 Post mortem examination of surgical patients demonstrated the tendency of the lymph nodes to block the spread of carcinoma even in advanced cases. Figures 2 and 3 illustrate that in spite of the extensive lymph-node metastases in the operative specimen, there were no metastases above the point of resection. The one node involved was about 1 cm. lateral to the widest point of resection, along the superior surface of the levator-anm muscle.

Experiments in which a suspension of insoluble particles was injected into afferent lymph channels of the mesentery of dogs and rabbits were also performed. It was found that the normal lymph node of a rabbit or dog would not pass a suspension of insoluble particles 1μ or less in diameter even when pressure of 120 cm. of water was used. The coloring of a number of adjacent nodes by the particles following the injection into a single afferent lymph channel was explained by the anatomical distribution of the collateral or retrograde lymph channels. The blockage of the afferent channels of one node with sodium morrhuate three or four days before the injection of the suspension produced dilatation of the collateral channels. It was shown that when a node was destroyed or blocked, the lymph drainage was re-routed through collateral channels, or by retrograde means, into a channel draining into a normal node.

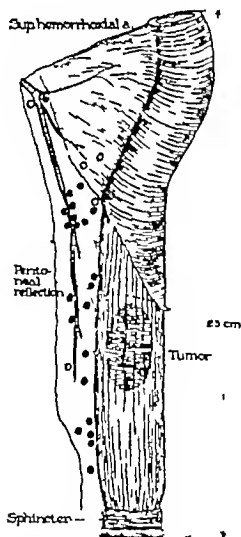


Fig 1 Operative specimen showing almost complete occlusion of superior hemorrhoidal artery by a mass of necrotic carcinomatous nodes. In some of the tightly packed nodes the carcinoma had penetrated through the capsule.

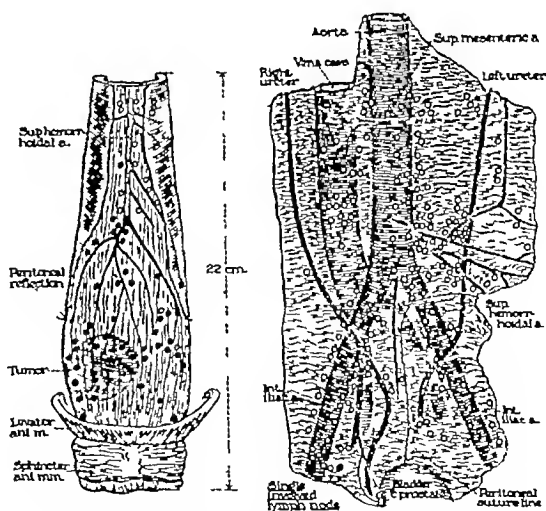


Fig 2 Operative specimen of carcinoma of the rectum showing extensive lymph node metastases above the tumor, and diagram of the autopsy preparation showing limitation of the upward metastasis.

Fig 3 The one node involved was just outside of the operative field—and it was a small subcapsular lesion. (Courtesy of J. B. Lippincott Co.)

N. W. A. WOLFE, M.D.

EXPERIMENTAL SURGERY

Witich, E., and Riley G. M. Quantitative Studies on the Hormones of Human Pituitaries. *Endocrinology* 1940, 26, 565

In this study the hypophyses of more than 100 human beings were dried with acetone and then gonadotropic, thyrotropic, lactogenic, and chromophorotropic hormones were measured by biological assays on various test animals. For the male part, immature female rats were used but sparrows, pigeons, and Weaver finches were also used.

No distinct variations according to age and sex were found with respect to the thyrotropic, the lactogenic, and chromophorotropic hormones. There was an appreciable difference in the quantity of the gonadotropic hormones in the different ages and sexes and at different periods in the life cycle. It is very small in children, while old women (more than fifty years old) and castrated women have very high values. In the productive age the hypophyses of men are about four times as potent as those of women of the same period. During pregnancy, the gland rapidly loses potency, regaining it toward the end and more rapidly after delivery. The human gonadotropic hormone is unusually rich in the follicle-stimulating fraction while the luteinizing hormone is present only in traces.

JOSEF WUNDERLICH, M.D.

Kawencheravsky V., and Hall, K. Pathological Changes in the Sex Organs After the Prolonged Administration of Sex Hormones to Female Rats. *J. Path. & Bacteriol.* 1940, 50, 195.

Experiments were performed on 81 normal rats or castrated female rats, pathological changes being produced in the uterus, vagina, and ovaries by various male and female hormones, injected alone or in various combinations for prolonged periods of from fifty-three to one hundred forty-six days.

Lengthening the period of injection of estrogens resulted in a greater size and weight of the uterus and vagina in castrated rats, and in a gigantic size of these organs in normal rats and the pathological changes in the sex organs were also increased.

The most important of these changes in the uterus were metaplasia and desquamation of the epithelium, and an increase in fibrous tissue in the mucosa of all the rats. Subepithelial edema and epithelial or sub-epithelial cysts appeared in the castrated rats. Glandular cysts and irregular development and edema of the circular muscle layer occurred in normal rats.

In all of the normal rats the vaginal epithelium was modified to various degrees, sometimes as much as during pregnancy. In the castrated rats, metaplasia did not appear until three or four months after the last injection of estradiol benzoate-butyrate.

Carcinoma cells are 7/8 or more in diameter in contrast to the particles used in the experiments, which were all less than 1/2 in diameter. The normal system of collateral lymph channels, plus the demonstration of retrograde channels available when the nodes were blocked, showed how much more likely spread of the large carcinoma cells was apt to be by collateral channels than by growth through the lymph nodes.

All these facts led to the conclusion that the lymphatic spread of carcinoma was primarily embolic. The nodes in which the emboli lodged prevented further spread until the node was completely overwhelmed by carcinoma. Further embolic spread was through the collateral channels, each new node involved tending to make longer and more difficult channel for a new embolus to travel. Spread from one node to another did not seem to be common, at least during the period when the lesions were operable. Thus the finding of a group of involved nodes within the field removable by surgery does not mean that such a case is hopeless, although the chance of complete removal is much less than in the cases in which such nodes are not found.

SAMUEL H. KLEIN, M.D.

DUCTLESS GLANDS

Celestino da Costa, A. The Paraganglia and the Sympathetic System (Paraganglia et sympathique). *Ann. Embryol.* 1939-40, 337.

After a short historical review the author discusses the anatomy, histology and embryology of the paraganglia. While, for the most part, the subject matter is treated as in a critical review the author has added several original observations particularly in relationship to the origin of paraganglia.

According to the author the three most important developments in the knowledge of the paraganglia were their origin from cells that immigrated from the spinal cord, their affinity for potassium bichromate (the reaction of Henke), and their resemblance to the suprarenal medulla. The anatomical distribution of the paraganglia in man and in the lower animals is described in great detail. The formations of sympathetic origin are considered first. In attempting to correlate the structures in which there is no evidence of a sympathetic connection the author describes the classification of Kohn who distinguishes three varieties: (1) chromaffin paraganglia, dependent upon the sympathetics, as the suprarenal medulla, the suprarenal bodies of the melachians, and the organ of Zuckerkandl; (2) the non-chromaffin paraganglia dependent upon the vagus; and (3) mixed paraganglia to which may be traced sympathetic and parasympathetic nerves such as the glossopharyngeal and the vagus in the carotid body. Various histological methods are discussed and an effort is made to explain the results of these methods on a histochemical basis.

The author discusses in a critical way the embryological proof that has been advanced to explain

In most of the rats the ovaries were enlarged or of normal size and weight, with enlarged or normal corpora lutea, in 1 rat the ovaries were very small, with few and mostly small corpora lutea. While the corpora lutea appeared to be of normal structure, the follicles were of small or of medium size and the majority of them were atretic or degenerated. The cells of the interstitial tissue were vacuolated.

Lengthening the period of injection of androsterone into castrated rats was followed by better development of the vagina but not of the uterus. The administration of androsterone in addition to estradiol caused a co-operative stimulating effect on the uterus and vagina of both castrated rats and normal ones, producing in the latter gigantism of these organs. When both hormones were injected, the vaginal epithelium of normal rats became mucified or swollen, while dropsical vacuolation usually appeared in the castrated rats. The ovaries were either large or atrophic and contained large or atrophic corpora lutea.

Lengthening the period of the injections did not strengthen the effect of dehydro androsterone on the sex organs of castrated rats. When estradiol and dehydro androsterone were injected simultaneously, the effect of the estradiol predominated, with disappearance of the mucification of the vaginal epithelium, which appeared after the injection of, and was typical for, dehydro androsterone alone.

Compared with experiments of shorter duration, lengthening the period of administration of testosterone esters into ovariectomized rats was followed by the development of a larger uterus and vagina, but a similar pathological structure. After simultaneous injections of testosterone and estradiol esters, a still greater development of these organs was obtained, but additional and sometimes very pronounced pathological changes appeared in the uterine mucosa—cystic hyperplasia of the glands ("Swiss cheese" mucosa), with adenomatous growth in some cases, and more or less general squamous metaplasia of the uterine epithelium. The myometrium, however, after injections of the two hormones, was better developed and of a more normal structure than it appeared to be after the injection of either of these compounds alone.

While in such cases the changes in weight and size of the sex organs, and the development of the myometrium were comparatively constant co operative effects, any of the changes in the mucosa could appear in different rats alone, or in some or all simultaneously, thus a resistance or predisposition of individual animals to these substances was demonstrated.

The addition of progesterone to male and estrogenic hormones was followed by the development of a smaller uterus and, because of the larger doses of estradiol used, there was an absence of pronounced progestational changes in the mucosa.

In the experiments of longer duration, testosterone propionate injected alone, in small doses, into normal adult rats caused a decrease in the size and weight of the uterus, while in large doses it produced a gigantic

uterus, abnormally distended with fluid which was either clear or contained leucocytes. The vagina was greatly hypertrophied following both large and small doses, while in the ovaries the development of corpora lutea and follicles was arrested.

In the experiments of shorter duration (twenty-one days), on the contrary, a gonadotropic (chiefly luteinizing) effect of testosterone propionate on the ovaries was observed.

Simultaneous injections of testosterone and estradiol esters were followed by the development of a gigantic uterus and vagina, the former having a pathological structure with glandular cysts. In the ovaries the follicular development was depressed, luteinization was decreased or absent, and the formation of follicular cysts of different sizes, in some cases very large, was a prominent pathological change.

The results obtained by different workers indicate the possible harmful effects of testosterone propionate on the uterus and ovaries. This must be taken into consideration in the therapeutic administration of this hormone to women.

Progesterone not only appears to lack a pathological action on the female organism, but, in rats, if given in suitable doses, it can prevent severe metaplasia of the uterine epithelium, and perhaps also some other pathological changes, such as adenomas and cysts. Since metaplasia of the uterine epithelium may be considered as the first stage of the precancerous changes produced by estrogens, the disturbance of the ratio of male and female sex hormones may, perhaps, play a part in the development of some human tumors, for treatment of which the effect of progesterone should be investigated.

SAMUEL KAHN, M D

Mellish, C H, Baer, A J, and Macias, A C. Experiments on the Biological Properties of Stilbestrol and Stilbestryl Dipropionate. *Endocrinology*, 1940, 26 273

Stilbene derivatives have a rather extensive use in Europe. In the United States they are being used in clinical investigations, and until their clinical safety and therapeutic value have been established, they will not be released for general clinical use.

Since the initial report of Dodds, Goldberg, Lawson, and Robinson on the preparation and estrogenic properties of stilbestrol, a number of workers have further compared the actions of this compound and of its propionic and acetic-acid esters with those of estrogens with a nucleus of the phenanthrene type. In the majority of experiments thus far published, the two classes of compounds have been found to be qualitatively similar in their action.

The present communication represents a study concerned with the action of stilbestrol and stilbestryl dipropionate upon (a) body growth, the reproductive system, and the pituitary and adrenal glands of immature rats, and (b) the immature rabbit uterus, with especial regard to the ability of the stilbene derivatives to sensitize it to progesterone.

Seventeen rabbits and 317 rats were used in these experiments.

Dodds, Lawson, and Noble and de Fremery and Geertling found that stilbestrol induced growth of the immature rabbit uterus and sensitized it to progesterone. In these experiments using the McPhall technique stilbestryl dipropionate was at least as effective as an equal weight of estrone in producing growth and development of the immature rabbit uterus and in sensitizing it to progesterone.

Neither stilbene derivative exhibited progestin-like action when administered to immature female rabbits in doses of 1 and 4 mgm., respectively over period of ten days.

Subcutaneous implants of 10 mgm of stilbestrol and stilbestryl dipropionate were made in thirty-day old rats. The animals were killed at 56, 57, and 58 days of age and autopsy studies were made. Stilbestrol inhibited body growth in animals of both sexes. In males the dipropionate caused a more effective inhibition of body growth and more prolonged action than stilbestrol. Stilbestrol inhibited the growth of the gonads of both sexes as well as of the seminal vesicles and prostate. Stilbestryl dipropionate caused greater suppression of the testes

and prostate than stilbestrol, but it inhibited the seminal vesicles to a lesser degree. Treatment with the stilbene derivatives increased the weight of the pituitary gland, but did not cause significant change in the weight of the adrenal glands.

Chorionic gonadotropin increased the ovaries of eight of rats previously treated with stilbestrol. The weight increment was equal to that produced by human pregnancy urine in untreated animals of the same age, but less than that resulting from its administration to immature animals.

Noble reported that the subcutaneous implantation of stilbestrol inhibited body growth and development of the genitalia of male and female rats through suppression of the anterior pituitary lobe hormone. However he found that the administration of chorionic gonadotropin stimulated the ovaries of stilbestrol-treated rats more than it did those of untreated controls. In these experiments, chorionic gonadotropin increased the ovarian weight of rats previously treated with stilbestrol. The weight increment was equal to that produced by human pregnancy urine in untreated animals of the same age but less than that resulting from its administration to immature animals. JOHN E. KIRK RICE, M.D.

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THE ETIOLOGY OF PRIMARY RENAL CALCULUS

ALEXANDER RANDALL, M.D., F.A.C.S., Philadelphia, Pennsylvania

'Common sense and worldly experience tell us that if we would overthrow an enemy we must understand all his resources, if we would overcome a difficulty we must understand where the difficulty resists our attempts, if we would solve a problem the nature of the problem must be understood. The principle underlying these statements should be applied in the prevention and cure of disease'—Sir James Mackenzie

PART I INTRODUCTION

WHEN one undertakes to discuss the etiology of renal calculus, one can either indulge in a critical analysis of the evidence supporting the various etiological theories, or else be very explicit, dealing only with what one considers to be the pertinent facts.

Thoughtful physicians throughout the ages have tried to reason out an answer to the centuries old riddle of the etiology of stone. Climatic surroundings have been suspected, racial susceptibility and heredity blamed, geographical districts held responsible, age criticized, sex analyzed, drinking water incriminated, personal habits examined, and even the texture of the skin held responsible. But scientific medicine has not been able to accept any of these generalities as in any way answering the question, nor in anywise aiding preventive therapy. These ideas have been so frequently presented, and so well expounded in the past, that I wish to be allowed to omit such entirely in my approach to the subject, and to restrict this presentation to a brief exposition of the scientific research work of the past ten years.

From the Department of Urology, the Department of Research Surgery, and the Wistar Institute of Anatomy, University of Pennsylvania, and the Laboratories of the Abington Memorial Hospital and the Philadelphia General Hospital.

This of necessity will require a restatement of some of the research problems that I have attempted and the relationship which they bear to research work elsewhere.

It is quite evident to any one familiar with the literature that a gradual change in our point of view has transpired during recent years. Renal stone has been treated in the past as a disease entity, based upon certain (but not known) causes. This attitude has been especially hard to correlate with the known and varied distribution of the condition and the wide diversity in the chemical composition of calculi. Of late a change from this point of view has been forced upon us, a realization that stone is, and has to be, only a symptom. This, in turn, has forced the realization that there then has to be a pre calculus lesion and that perhaps the variation in the chemistry of stone is only incidental. There has been coined a new word, "calculogenesis" to cover this entire problem of the growth of a calculus, and research of late has been striving to find and to prove the various stages that antedate the well known clinical state in which a calculus is producing, for the first time, active and alarming symptoms.

GENERALITIES

Clinically, a renal calculus is recognized only after its growth has reached what might be called its maturity. That this growth has consumed time hardly requires any argument, and that symptomatic silence is the rule during this time is likewise evident. Nevertheless, in a great many articles of the past the idea seems to have been accepted that the time element between a stone's

origin and the development of clinical symptoms was of no importance or else that the time required for growth was very brief. That this one point alone is of the utmost importance should be stressed, for the facts are only too self-evident that the growth of a calculus is extremely slow and because of this any explanation of calculogenesis must account for this period of symptomatic silence.

Clinically cases of renal calculus have been classified as primary or secondary and as these terms have been differently applied, their definition as used here is necessary. *Primary renal calculi* infer those for which no apparent causal factor—in the kidney pelvis, or ureter—can be clinically recognized. I.e. no renal abnormality, no obstructive uropathy, no recurrent hematuria, no persistent infection, and no recognized metabolic fault, all of which are definite and well recognized pathological conditions in which crystal formation and deposition may logically occur and a calculus grow. *Secondary renal calculi* include those for which such causal factors do exist and can be clinically recognized. From another point of view a secondary renal calculus is one for which the clinician or surgeon can recognize a pathological or physiological fault and feel certain that its correction becomes an essential step in the cure and the prevention of the recurrence of stone. These cases of secondary renal calculus, complicated as they are with other recognized physiological or pathological conditions, must be put aside from this study as they only confuse the essential picture of the etiology of simple primary renal calculus.

It is the elucidation of the etiology of the primary renal calculus that engrosses us today as we know full well that over 50 per cent of the cases of renal stone fail to prevent clinical evidences as to why they occur after the most careful scrutiny by all the diagnostic means at our disposal. To make this point unquestionably clear I refer in speaking of primary renal calculus, to the patient who presents himself at the clinic in his first sudden attack of ureteral calculus colic, who shortly thereafter passes per urethra a typical renal calculus, and yet who, on the most careful and painstaking study presents no cause or reason why he suffered therefrom, and the surgeon is completely baffled to give any advice that might prevent a recurrence of the painful malady.

If we are to explain the cause of renal calculus, it becomes evident that it is in this simple group of primary calculi, uncomplicated by secondary factors, that our answer lies, while at the same time the apparent simplicity of the problem, its

uncomplicated picture, and its clinical importance all challenge our most thoughtful endeavors. It is to this problem alone that this paper is devoted.

It has been well said that an intelligent approach to any research problem may be gained "by asking mother nature simple questions one by one, and I believe we can clear up a great many misunderstandings, and proceed on a common ground of knowledge, by an analysis at the time as to what are the evident and recognized fundamentals of our problem.

In the first place it is self-evident that such a primary renal calculus has its origin within the limits of the renal pelvis, including both major and minor calyces. This excludes a true renal origin (i.e. an origin within the renal structure excepting perhaps the very terminal portions of the collecting ducts in the tips of the renal papillae.

Secondly in the absence of urinary obstruction (and I mean demonstrable obstruction by investigative methods of today) it becomes absolutely essential that any etiological explanation must take into account where the calculus resided while attaining growth, for otherwise it would not remain for long within the pelvis, but be expelled while still of minute size.

Thirdly primary renal calculi (with very rare exceptions) are composed of salts normally present in normal urine; there are no evidential exogenous factors present.

Fourthly the chemical composition of stone, varying as it does between eight or more salts, gives nothing especially characteristic in form or structure that suggests its origin, other than those characteristics typical under the laws of crystallization and for the individual salt present.

SPECIALITIES

Such generalities are easily agreed upon, and we can proceed to a closer questioning of certain features, the most interesting of which is to determine an acceptable reason to account for the element of time during which a stone gains its growth. A specific case will illustrate this point.

A woman was examined by means of a roentgenogram in 1934 (Fig. 1) in search for a cause of left-sided backache, and a small, triangular shadow was observed within the outline of the lower pole of the right kidney and thought to be a renal calculus. A second picture was taken in 1935, and the shadow was observed unchanged. Again, in 1937 another picture was taken (Fig. 2) and, although the position of the shadow was unchanged, there was a slight increase in size and density. There having been no symptoms there-

from in this interval of three years, it was decided to prove whether or not it was a renal calculus. An intravenous urogram (Fig. 3) left no doubt that it was such and that it was situated in one of the inferior minor calyces, and that otherwise the kidney pelvis was normal. One and a half years later in acute attack of right renal colic occurred. In seventy-two hours the shadow was in the lower third of the ureter (Fig. 4) and after two cystoscopic manipulations the calculus was passed per urethra still showing its characteristic triangular shape.

Experiences such as this—and they are not uncommon—present the most important deductive evidence.

First, it was without question that the calculus had its origin and subsequently grew during four and one half years of observation, attached to some portion of a minor calycean structure, and during this interval presented no symptoms. Once freed from its attachment and in a few days, the body had rid itself of this calculus. Let me accentuate two things of great importance: (1) the long interval of time during which it was *known* to be present and (2) its absolutely asymptomatic existence!

A second deduction is permitted—that there must have been some reason why that calculus formed at that point—and one must assume an initiating lesion to have existed there prior to the stone's crystallization.

A third deduction may be stated, for not only in this case, but in many similar instances, roentgenographic studies leave little doubt that these typically primary renal calculi take their origin within the shadow outline of a minor calyx, and, therefore, the precalculus lesion must occur thereabouts.

A fourth deduction may be permitted—that the lesion which acts as the nidus for the crystallization of common urinary salts thereon would most likely occur upon the actively functioning renal papilla, rather than upon the simple lining membrane of a minor calycean wall.

And so, it becomes increasingly self-evident that such a stone has to be the product of a localized morbid process which antedated the period of salt crystallization and true calculus formation. Such I have termed the *initiating, or precalculus, lesion*. Every thing points to it, every known fact strongly suggests it, every pertinent question demands it, the laws of crystallization are nullified in its absence, and pathology itself is incomplete without it.

I believe that for a successful research explaining the etiology of primary renal calculus, we

must cease to think in terms of a clinical condition and turn ourselves to think in terms of morbid anatomy. I consider such a change of approach the most far-reaching concept in the entire problem.

With these self-evident facts as a guide, in 1929 we began a series of experimental research problems in animals in an effort to create such an initiating lesion with the hope that we would be able to observe calculi grow thereon. These problems have been published elsewhere (Randall, 1937), and it is only necessary at this time to report either failure in some of the problems, or such inconsistent results in others as to make further pursuit futile.

There was one small study, however, that gave a valuable positive evidence. It was thought that if stone grew upon and from some mural lesion, visible evidence of this attachment should be recognized on magnification and study of such stones. A group of 265 calculi were studied, all of which had been voided per vias naturales or removed by ureterolithotomy, and the time element had been short between the onset of colic and delivery from the body. A visible facet giving unquestioned evidence of mural attachment, was present in 106, or 40 per cent of these specimens. Such appeared generally as a smooth area on the surface of a highly crystalline calculus, and often was depressed with the edges encroaching and overhanging. It was frequently observed to be of a different color, and suggested a different composition. Magnification increased the presumptive evidence that this was the stomal, or facet, of original mural attachment.

It was during these formative years, though marked by many experimental disappointments, that our hypothesis of the necessity of a precalculus, or initiating, lesion became stronger and stronger, and two postulates were written which it was hoped in the end we would be able to verify and prove, to wit:

1. That there must always be an initiating lesion which precedes the formation of a primary renal calculus.

2. That such an initiating lesion was to be looked for on the renal papilla.

A search of the literature for the then known pathology of the renal papilla was most disappointing. The hemorrhagic papillitis of Fenwick, the uric-acid infarcts of the newborn, the calcium infarcts of Henle (Lubarsch), and the occurrence of tuberculous ulcerations (Sieberthal) cover about all that had been recognized by the pathologists as primary lesions. I do not wish to slight numerous isolated observations of various

individuals reporting odd cases. I have not found any that related their observations to the wide problem of calculus disease, and I refer more to accepted teachings as outlined in the books on gross and microscopic pathology. In fact, the survey of this literature left one with the distinct feeling that the pathology of the renal papilla was yet to be written.

It was therefore felt that any research directed toward an understanding of the etiology of primary renal calculus should try—

1. To establish the existence of an initiating lesion.
2. To demonstrate that stone will and does, develop thereon.
3. To explain the pathology of such an initiating lesion.
4. To deal with an appreciation of the reasons why such a lesion develops, its cause, and perhaps its prevention.
5. To relate these observations to the existing theories, through animal experimentation.
6. To point out such preventive measures as may be expected to bear results.

PART II. RESEARCH ON THE ETIOLOGY OF PRIMARY RENAL CALCULUS THROUGH AUTOPSY STUDIES

As our animal experimental efforts had given negligible results, it was decided to go to the autopsy table and by dissecting out each minor calyx to the complete exposure of its individual papilla, to uncover whatever observations awaited us, and to hope that time, patience, and industry would reward our efforts by possibly showing us lesions that could be related to stone's origin and growth and, perhaps, to the actual finding of early crystalline deposits. In other words, instead of trying to *create* stone experimentally by following theoretic dogma, we turned to trying to *find* stone as it occurred in man, to observe it in its incipency to record its point of origin and to study microscopically its causal factors. The co-operation of the Department of Pathology at both the Hospital of the University of Pennsylvania and the Abington Memorial Hospital made this effort possible, and at my request each put at my disposal the kidneys from all autopsies, to be opened and sectioned as we saw fit. Each kidney was examined by first opening the pelvis, and from it, by careful dissection each major and minor calyx was laid open in turn and each papilla completely visualized and studied with a hand lens. After six months the large autopsy material from the Philadelphia General Hospital was added, greatly amplifying our opportunities.

TABLE I.—RESULTS OF AUTOPSY STUDIES

Date	Total number of autopsies	With calculus plaques		Primary renal calci	
		Number	Per cent	Number	Per cent
May 1935	104				
Dec. 4, 1935	398	28	9.4	2	7
Feb. 3, 1937	430	73	7	28	6.5
May 3, 1937	600	140	23.9	40	4
Dec. 1938	54	27	9.6	65	5.4

Starting in December 1935, there have been examined to date (December 1, 1938) 1,154 pairs of kidneys. Two hundred and twenty-seven individuals, or 19.6 per cent, have shown calcium-salt deposition, either unilateral or bilateral, of one or more of the renal papillae, and 65 individuals revealed a primary renal calculus growing upon and attached to a renal papilla. The statistical progress of this research is presented to illustrate the consistency of our findings as tabulated and reported at varying intervals and with our increasing experience.

TABLE II.—678 CONSECUTIVE AUTOPSIES

Age	Autopsies	Plaques	Per cent	Stones	Per cent
10-19	27		3.7		
20-29	4	4	9.7		4.8
30-39	70	8	3.9		5
40-49	94	8	9	5	5.3
50-59	24	14	58.3	3	12.5
60-69	14	39	27.4	4	28.6
70-79	30	16	53.3	7	23.3
80-89	4	4	9.7		

Our interest has centered particularly about what might be called the minor pathological changes, and kidneys showing gross destructive pathology—pyonephrosis, advanced tuberculosis,—are not included at all. In other words, kidneys heretofore passed as having normal pelvis have been the ones we particularly searched for early papillary lesions.

PAPILLARY LESION TYPE 1. THE CALCIUM PLAQUE

Starting our post-mortem series we examined 27 normal kidneys before encountering our first papillary lesion. This lesion was so innocent in appearance and yet so definitely abnormal when compared to our previous observations, that it demanded attention. There was present a cream-colored area near the tip of a renal papilla, which was definitely not on the surface, but appeared to be subsurface or subepithelial. Shortly thereafter we found 4 kidneys that showed similar lesions—some with a deposit in only 1 papilla, others with involvement of several papillae some with cal-

lateral involvement, others showing bilateral papillary involvement. On microscopic study the lesion was found to be a plaque of calcium salts deposited in the interstitial tissue of the renal papilla, and definitely not intratubular. In places, rings of calcium salts were to be seen, where deposition had occurred in the collagenic membrane of the collecting tubules and where such were in close proximity, interstitial deposition created solid masses visible to the naked eye. Special microscopic stains were used to identify this material as calcium, and sufficient was collected by teasing out such plaques for chemical analysis and proved to be composed of salts of calcium. Dr James H. Jones of the Department of Physiologic Chemistry of the University of Pennsylvania analyzed 4.65 mgm of such material for me, to find calcium to occur in 4.967 per cent (5 per cent). As muscle, liver, lung, and kidney contain only from 0.1 to 0.5 per cent, it left little doubt that calcium was present in high concentration. Dr Charles G. Grosscup of the Abington Memorial Hospital, with 1.9 mgm of material, composed of plaques carefully teased from visible papillary lesions and carefully separated from all organic material, undertook a quantitative analysis. He reported that the material was microcrystalline and chalky in appearance, was insoluble in water and acids, but dissolved in alkalis. Quantitatively, calcium was present in 19 per cent, nitrogen in 10 per cent, carbon dioxide in 1 per cent, and phosphorus was present, but it was difficult to estimate the amount accurately. He stated, "In view of the low CO_2 and phosphorus content and the high calcium (19 per cent) it is evident that about 80 per cent of the calcium must be bound in some other form. With the murexide test indicating xanthine, the insolubility of the material in acids, and the high non-protein nitrogen, I suggest that this may be nucleic acid."

It is my wish at this point to emphasize especially that this lesion, or morbid process, as we have found it, occurs particularly in the walls of the renal papilla—some are centrally placed, some just subsurface, that it is not essentially an intratubular deposit, but a broad plaque of calcium-salt deposition invading and replacing interstitial tissue (Fig 5), that, from our studies, its first deposition is in the collagenic, or basement, membrane of the walls of the collecting tubules, from which it gradually involves the intertubular spaces and causes the tubules gradually to shrink, to lose their lining cells and disappear, or to remain with markedly narrowed lumens, that in the many sections which we now have studied, of practically

all the lesions mentioned, in only 9 (3.9 per cent) have there appeared cellular destruction and round-cell infiltration, which could be interpreted as evidence that infection accompanied this calcium-salt deposition. These exceptions I consider as the inevitable finding when taking such material from the autopsy table, and believe that it represents a secondary factor where infection has been implanted upon a pre-existing pathological condition.

Early in the series a kidney was found with four of the seven papillae containing calcium plaques, and on one such calcium plaque a secondary deposit of some black material could be seen. This deposit was about 1 mm in diameter and quite distinctly visible (Figs 6 and 11). Microscopic sections of this specimen showed evidence that, through increasing growth and pressure, this calcium plaque had lost its epithelial covering, and on its surface was being deposited a layer of some different material that was black in color. Its minute size defied chemical analysis and specific staining methods, but from our subsequent studies we now look back upon this tiny speck as the earliest evidence of renal calculus formation ever seen and recorded as such.

The next important step in calculogenesis was observed with the examination of a kidney in which a small stone was found, which was, however, unfortunately dislodged by the knife as the kidney was opened. Search of this same kidney, however, revealed another papilla which contained a visible calcium plaque supporting a second stone which projected into the lumen of the minor calyx (Figs 7 and 8). This stone was firmly adherent, measured approximately 2 mm in diameter, and resembled in appearance the larger calculus which the knife had dislodged. Study of these specimens has been most valuable in the first place the dislodged stone has been analyzed and proved to be composed of calcium phosphate, microscopic sections of the adherent stone have demonstrated unquestionably that it is growing from, and is supported by, a typical calcium plaque imbedded in the wall of the renal papilla, special stains have shown that this stone is also of calcium phosphate, while the plaque itself is composed of calcium but does not show, on specific staining, phosphate as a salt. So here we have a definite renal calculus growing on an initiating lesion of the papilla, and while the lesion is a deposition of one calcium salt in the walls of the renal papilla, the calculus is composed of a totally different calcium salt.

The demonstration of this fact just stated—that the two are distinctly composed of different salts of

calculus—becomes most vital factor in our conception of the origin of renal calculus and is to be emphasized. Here for the first time we find a lesion of not infrequent occurrence (19.6 per cent) and of rather constant character and chemical composition. This lesion innocent enough while buried in the wall of a renal papilla can lose its epithelial covering and from then on be bathed in calcine urine and then acting as a foreign body it becomes the nidus upon which a different urinary salt crystallizes. Here I realize we can picture the reason that renal calculi can remain stationary while increasing in size. Here we can account for common origin of stone formation which also allows of the known variation of salts so deposited to form stone and we can assume that the salt which crystallizes to form a calculus is the one which at that epoch is most readily precipitated from solution. Study of the serial sections through this stone has likewise shown us, at the edge of the plaque, a definite elevation of the plaque by the encroachment of crystallization, which suggests that when stone becomes free it does so by tearing the plaque from its tissue bed and taking it away with it. This quite corroborates our observation mentioned before a visible facet or stone in 40 per cent of 265 primary renal calculi.

From this point on our studies have taken a variety of directions most of which have been published in one form or another and I wish to recount here only the final figures and the essential microscopy. We have observed to date 65 kidney specimens in which calculi have been seen growing upon papillae. Thirty-one of these have had a single stone present, while in 30 specimens two papillae were found with stones adherent, and varying combinations make up the remainder including 30 instances of tiny black deposits, less than 1 mm in diameter that have repeatedly shown us the earliest evidence of beginning secondary deposition upon the fundamental or primary lesion of papillary calcium salt deposit, i.e., upon the calcium plaque.

It had been our purpose to try to demonstrate that each calculus as found was supported by a primary intrapapillary calcium plaque as its initiation lesion. The extreme difficulty of this will be readily understood. In the first place such calculi have to be properly decalcified before sectioning—not completely decalcified, of course but enough to allow sectioning—and in doing this we lost specimens. Again, we tried to depend upon special stains in an effort to differentiate the various possible salts. This required special methods of tissue fixation, which, in turn dissolved some specimens and others were made so brittle

as to be completely fragmented on sectioning. In addition it has been difficult, and most tedious, to attempt complete serial sectioning of stones 6 and 8 mm. in diameter in order to cut through the stone and its possible underlying plaque which frequently is minute and generally eccentrically placed.

In order to avoid these disappointments, three other procedures have been adopted in order to prove that each calculus arises from a calcium plaque in the wall of a papilla. First, a few selected specimens have been subjected to tissue clearing methods, and by this means we hoped to visualize through the cleared papillary wall the underpinning of the calculus upon the papilla's surface. This proved unsatisfactory at first, as the tissue-clearing solutions dissolved the calculi too readily. We shall be able, I believe, to circumvent this in the future, and I hope to be able to so demonstrate a calculus and its intrapapillary plaque foundation.

The second method was discovered accidentally when a tiny black stone 3 mm. in diameter was inadvertently dislodged. On examining it under a strong lens, it was distinctly seen to be composed of a black mass with a bowed surface, stimulating the early jackstone development of the calcium-oxalate stone, but on one surface a clear cut white layer was attached, distinctly different and definitely crystalline. This we inferred to be the calcium plaque. Through the co-operation of Dr. A. Newton Richards these two layers were analyzed separately. The calculus weighed 3.5 mgm. (Fig. 9). Microchemical analysis was made, which showed that the white layer, or calcium plaque, was composed of calcium carbonate with a decided trace of calcium phosphate. The black stone gave a negative test for calcium carbonate, calcium phosphate, and uric acid, but was conclusively proved to be pure calcium oxalate. This is most significant finding for here again on papillary plaque composed of calcium carbonate and calcium phosphate stone composed of dihydrate salt calcium oxalate has formed. Two other calculi of similar character have been gently dislodged from their papillary attachments, and in each case the white plaque is plainly visible. This, to a degree, suggests and strengthens the assumption that as calculus is extruded in life it gains its freedom by tearing away its supporting plaque from its original tissue bed. Such is to be observed in one of our specimens subjected to microscopic section in which can be seen the crystalline material burrowing under the edge of the calcium plaque and elevating it from its papillary tissue bed (Fig. 10) which gives micro-

scopic proof that a primary renal calculus gains its freedom by tearing away the calcium plaque on which it grew

The third method of proof arose through the x-ray study of a known uric-acid calculus. This calculus has long evaded our efforts to prove that it had a similar origin upon a primary papillary plaque. Decalcification for microscopic sectioning, as in the calcium-phosphate stone, is, of course, utterly out of the question. Microchemical analysis, as in the calcium-oxalate calculus, of a long series of stones as found at autopsy, in the hope that chance would favor us, was also asking too much, both of our chemical friends and of chance itself. However, chance did favor us in an unexpected way, and proof was forthcoming from a clinical study, substantiated by a restudy of previous clinical cases and by chemical analysis.

A patient presented himself at the clinic with left renal colic, and on study a diagnosis was made of a large x-ray negative stone occupying the right renal pelvis, while on the symptom-bearing left side a small stone completely blocking the left ureteropelvic junction could be recognized. Operation was performed for the removal of the small stone on the left, following which the stone was roentgenographed by itself. Figure 10a is a print from the plate obtained. One recognizes in this picture the shadowy outline of the true uric-acid calculus, the same having been subsequently analyzed and proved of such a chemical nature, while in the center of this shadow is seen the dense outline of a second salt. This finding sent us back to our collection of specimens, and in 5 other uric-acid stones a similar inclusion has now been demonstrated. This led us directly to a sectioning of the calculus and a chemical analysis of its included dense shadow, which proved it to be a calcium salt positive for calcium carbonate and calcium phosphate. Here, then, we have substantiating evidence that a third type of primary renal stone was formed from a salt of a different chemical nature from the plaque on which it grew, and it was recognized by a third means of identification, i.e., roentgenology.

Thus, we have three distinct and different chemical salts, each forming characteristic primary renal calculi and each representative of the frequent clinical cases, which are now proved to have their origin from an initiating lesion in the renal papilla. It is to be hoped that the rarer and unusual salts which form stone will, in time and in their turn, be found to have a similar origin.

While these researches have been furthered in an effort to substantiate the idea of a papillary

initiating lesion, and to prove quite definitely the rôle played by the calcium-plaque formation and its relationship to the clinical occurrence and growth of a renal calculus, we have been keenly interested also in trying to solve the *raison d'être* of the deposition of calcium salts in the wall of the renal papilla. Many specimens have been sectioned for microscopic study, and the pathology as we have interpreted it follows. One need not accentuate the prevalence of calcium-salt deposition in many parts of the body in response to tissue damage and repair. The writings of H. G. Wells and the recent excellent article on "Calcification and Ossification of the Kidney" by Goldstein and Abeshouse cover this ground thoroughly, and as Quinby says, "Pathology has long ago demonstrated the *early and easy* deposition of calcium in any area in which the tissues have become avascular, with fragmentation of the cells and intercellular substance." I am obliged especially to Dr. John Eiman, Pathologist of the Abington Memorial Hospital, for the following detailed description, and to Dr. Balduin Lucké, Professor of Pathology, University of Pennsylvania, for his interest and aid in obtaining special staining methods and in section cutting, as well as his coincidence with the opinions expressed on the microscopic pathology.

Microscopic pathology. Normal papilla. The normal papilla is covered by cells which differ from those lining the calyces and the collecting tubules, in that they are flat and very thin and form a single layer, they are modified cells of the lining epithelium of the collecting tubules. The collecting tubules in the papilla vary considerably in diameter, the larger ones, or the ducts of Bellini in the area cribrosa on the apex of the papilla, measuring from 100 to 200 microns in diameter. The cells lining the collecting tubules are arranged as a regular single layer, with their nuclei at one level and their free surfaces bulging slightly into the lumina. The smaller collecting tubules are lined by sharply defined cuboidal cells. As the collecting tubules grow larger, the cells become higher and in the ducts of Bellini acquire a tall columnar form. The epithelium of the collecting tubules rests upon a well developed and distinct basement membrane. The interstitial connective tissue in the papilla is more abundant than in the cortex and medulla of the kidney, and there is an abundant amorphous ground substance.

The simple calcium plaque (Fig. 5). Approximately midway between the tip and the base of the papilla, underneath the epithelial covering, is an area measuring 2.5 mm. in length and vary-

calcium—becomes most vital factor in our conception of the origin of renal calculus and is to be emphasized. Here for the first time we find a lesion of not infrequent occurrence (20.6 per cent) and of other constant character and chemical composition. This lesion is innocent enough while buried in the wall of a renal papilla, it loses its epithelial covering and from then on be bathed in calcine urine and then acts as a foreign body. It becomes the nidus upon which a different urinary salt crystallizes. Here I know we can picture the reason that renal calculi can remain stationary while increasing in size. Here we can account for a common origin of stone formation which also allows of the known variation of salts so deposited to form stone and we can assume that the salt which crystallizes to form a calculus is the one which at that point is most readily precipitated from solution. Study of the serial sections through this stone has likewise shown us at the edge of the plaque a definite elevation of the plaque by the encroachment of crystallization, which suggests that when a stone becomes free it does so by tearing the plaque from its tissue bed and taking it away with it. This quite corroborates our observation mentioned before a visible facet or stoma in 40 per cent of 165 primary renal calculi.

From this point on our studies have taken a variety of directions, most of which have been published in one form or another and I wish to recount here only the final figures and the essential microscopy. It has been observed to date 65 kidney specimens in which calculi have been seen growing upon papillae. Thirty-one of these have had a single stone present, while in 10 specimens two papillae were found with stones adherent, and varying combinations make up the remainder including 6 instances of tiny black deposits, less than 1 mm. in diameter that have repeatedly shown us the earliest evidence of beginning secondary deposition upon the fundamental or primary lesion of papillary calcium salt deposit. I.e., upon the calcium plaque.

It had been our purpose to try to demonstrate that each calculus as found was supported by a primary intrapapillary calcium plaque as its initiation lesion. The extreme difficulty of this will be readily understood. In the first place such calculi have to be properly decalcified before sectioning—not completely decalcified, of course, but enough to allow sectioning—and in doing this we lost specimens. Again, we tried to depend upon special stains in an effort to differentiate the various possible salts. This required special methods of tissue fixation which, in turn, dissolved some specimens, and others were made so brittle

as to be completely fragmented on sectioning. In addition it has been difficult and most tedious to attempt complete serial sectioning of stones 6 and 8 mm. in diameter in order to cut through the stone and its possible underlying plaque which frequently is minute and generally eccentrically placed.

In order to avoid these disappointments, three other procedures have been adopted in order to prove that each calculus arises from a calcium plaque in the wall of a papilla. First, a few selected specimens have been subjected to tissue-clearing methods, and by this means we hoped to visualize through the cleared papillary wall the underpinning of the calculus upon the papilla's surface. This proved unsatisfactory at first, as the tissue-clearing solutions dissolved the calculi too readily. We shall be able I believe, to circumvent this in the future and I hope to be able to so demonstrate a calculus and its intrapapillary plaque foundation.

The second method was discovered accidentally when a tiny black stone 3 mm. in diameter was inadvertently dislodged. On examining it under a strong lens, it was distinctly seen to be composed of a black mass with a bowed surface simulating the early jackstone development of the calcium-oxalate stone, but on one surface a clear cut white layer was attached, distinctly different and definitely crystalline. This we inferred to be the calcium plaque. Through the co-operation of Dr. A. Newton Richards these two layers were analyzed separately. The calculus weighed 5.3 mgm. (Fig. 9). Microchemical analysis was made, which showed that the white layer, or calcium plaque was composed of calcium carbonate with a decided trace of calcium phosphate. The black stone gave a negative test for calcium carbonate, calcium phosphate, and uric acid, but was conclusively proved to be pure calcium oxalate. This is most significant finding for here again on a papillary plaque composed of calcium carbonate and also in phosphal stone composed of a different salt calcium oxalate has formed. Two other calculi of similar character have been gently dislodged from their papillary attachments, and in each case the white plaque is plainly visible. This, to a degree suggests and strengthens the assumption that, as a calculus is extruded in life it gains its freedom by tearing away its supporting plaque from its original tissue bed. Such is to be observed in one of our specimens subjected to microscopic section in which can be seen the crystalline material burrowing under the edge of the calcium plaque and elevating it from its papillary tissue bed (Fig. 10) which gives micro-

scopic proof that a primary renal calculus gains its freedom by tearing away the calcium plaque on which it grew

The third method of proof arose through the x-ray study of a known uric-acid calculus. This calculus has long evaded our efforts to prove that it had a similar origin upon a primary papillary plaque. Decalcification for microscopic sectioning, as in the calcium-phosphate stone, is, of course, utterly out of the question. Microchemical analysis, as in the calcium-oxalate calculus, of a long series of stones as found at autopsy, in the hope that chance would favor us, was also asking too much, both of our chemical friends and of chance itself. However, chance did favor us in an unexpected way, and proof was forthcoming from a clinical study, substantiated by a restudy of previous clinical cases and by chemical analysis.

A patient presented himself at the clinic with left renal colic, and on study a diagnosis was made of a large x-ray negative stone occupying the right renal pelvis, while on the symptom-bearing left side a small stone completely blocking the left ureteropelvic junction could be recognized. Operation was performed for the removal of the small stone on the left, following which the stone was roentgenographed by itself. Figure 10a is a print from the plate obtained. One recognizes in this picture the shadowy outline of the true uric-acid calculus, the same having been subsequently analyzed and proved of such a chemical nature, while in the center of this shadow is seen the dense outline of a second salt. This finding sent us back to our collection of specimens, and in 5 other uric-acid stones a similar inclusion has now been demonstrated. This led us directly to a sectioning of the calculus and a chemical analysis of its included dense shadow, which proved it to be a calcium salt positive for calcium carbonate and calcium phosphate. Here, then, we have substantiating evidence that a third type of primary renal stone was formed from a salt of a different chemical nature from the plaque on which it grew, and it was recognized by a third means of identification, i.e., roentgenology.

Thus, we have three distinct and different chemical salts, each forming characteristic primary renal calculi and each representative of the frequent clinical cases, which are now proved to have their origin from an initiating lesion in the renal papilla. It is to be hoped that the rarer and unusual salts which form stone will, in time and in their turn, be found to have a similar origin.

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The simple calcium plaque (Fig. 5) approximately midway between the tip and the base of the papilla, underneath the epithelial covering, is an area measuring 2-5 mm. in length and vary-

ing from 0.1 to 0.3 mm. in width, composed of dense connective tissue. The surface of the papilla over this area is somewhat irregular. The blood vessels in this location are less numerous, and those present are partially obliterated by the surrounding dense connective tissue. Some of the collecting tubules are devoid of lining epithelium, while other tubules show cells with degenerative changes. In the portion of this region nearest the papilla a tip there are number of small areas showing granular detritus. In this location are seen two small irregular deposits of purplish-staining material (H. and E.) measuring approximately 0.3 by 0.03 mm. By special staining methods these deposits prove to be calcium salts. These calcium-salt deposits, or plaques, are separated from the surface of the papilla by a thin irregular layer of connective tissue and covering epithelium. Where the calcium is less dense it occurs in rings, definitely deposited in the basement membrane of the tubules and spreading therefrom into the ground substance of the surrounding connective tissue.

Throughout the papilla, but especially near the tip there are areas showing an increase of interstitial connective tissue. Some of the blood vessels show narrowing and irregularity of their lumina. The cortex and medulla show no noteworthy lesions. The walls of the convoluted tubules show no calcium-salt deposits. The larger vessels show moderate degree of arteriosclerosis. *This is microscopic evidence of a section in this specimen.*

Such is the microscopic appearance of the simple deposition of calcium salts in the renal papilla, taking the form of a shell of chalk, quite comparable to similar changes seen in the lung, spleen or arteries, when tissue damage has occurred and reparative efforts have followed. Such deposition may occur in any part of the renal papilla but our observations sustain the point that it is rarely diffuse and frequently only one plaque is observed on one single papilla after close inspection of both organs. Such a plaque imbedded in the papilla, and so protected, remains innocent of any implication in the causation of stone until the succeeding stage develops.

Fully developed calcium plaque or initiating lesion (Figs 6 and 11). Near the tip of the papilla there is a loss of continuity of the surface with the formation of a shallow depression. In this depression is situated an irregular plaque measuring 0.6 mm. in length and from 0.1 to 0.2 mm. in width, which by special staining proves to be

composed of calcium salts. This plaque shows numerous small, roughly rounded spaces which vary in size. Over the surface of this blue staining calcium plaque there is a distinct layer of brownish material which measures 0.05 mm. in thickness. This layer is definitely of different material from the calcium plaque. The calcium plaque is not uniform in texture in the looser parts about the periphery the calcium salt is seen deposited in the basement membrane of partly compressed collecting tubules. There are a few tubules which show deposition of the calcium salt in some of the lining cells, while other cells are completely preserved.

Special stains of sections from this specimen show that when the calcium salt is to be deposited, it appears to be laid down first of all as fine granules in the basement membrane of the collecting tubules. With further deposition such granules coalesce until the calcification appears as a complete ring encircling the tubule generally with loss of epithelial lining, though occasionally there can be found some viable cells. From this point the calcium salt is further deposited in the ground substance of the surrounding connective tissue with gradual generalized coalescence and plaque formation. There is no evidence of a deposition of calcium salts in the convoluted tubules.

Near the plaque and at the tip of the papilla are seen many large, roughly rounded, irregular spaces, many of them devoid of epithelial lining, but some showing epithelial cells in different stages of degeneration. These large spaces undoubtedly are cross sections of large collecting tubules or ducts of Bellini that have lost their normal epithelial lining. Toward the base of the papilla the dilatation of the collecting tubules is less marked and the lining shows consistently larger numbers of epithelial cells with lesser degrees of damage. *This is no microscopic evidence of a section in this specimen.*

This we have termed the fully developed initiating lesion for here we see for the first time a brown secondary deposit, with entirely different staining properties, laid down in laminae upon a simple calcium plaque. *The essential point is that this plaque has lost its epithelial covering, and is now bathed in alkaline urine hence the perfect medium for crystallization exists.*

Calculi growing on plaque (Figs 7, 8 and 9). On opening of the kidney pelvis this specimen showed a definite concretion, approximately 3 mm. in size and firmly attached to a papilla. The specimen was fixed and sectioned successfully. Sections of this specimen show in the center of

(The special stains used in this study are von Kossa, Eosin, Gomori, Masson, azocarmine, fast-green stain, Gomori and Mallory, methylene blue, and periodic acid stain for uric acid and uric acid.)

the papilla near its tip irregular calcium-salt deposits over an area 2.2 by 0.6 mm, these are deeply imbedded and far from the surface of the papilla. Lateral to this and distinctly near the surface of the papilla occurs a second calcium-salt deposit measuring approximately 0.4 by 0.1 mm. It is a characteristic calcium plaque. Supported by this plaque and growing from it alone is an irregularly shaped calculus measuring 1.75 by 0.8 mm. A second calculus found in this kidney was analyzed and proved to be composed of calcium phosphate. The sections of this specimen, when stained by the von Kossa technique, show this calculus to be composed of calcium phosphate, but it is of particular interest that the calcium plaque shows no phosphatic staining. All methods for specific staining prove the plaque to be composed of a calcium salt, but definitely not calcium phosphate.

Here, therefore, is microscopic evidence to prove that a stone visible to the naked eye as attached to a renal papilla actually grows from an intrapapillary calcium plaque and is supported thereby, and, furthermore, that a stone of one proved chemical composition (calcium phosphate) grows from or crystallizes upon the surface of an intrapapillary plaque of a different chemical composition.

All lesions on one papilla (Fig. 12). This papilla shows a number of subsurface lesions. Near the surface on the side of the papilla there is (1) a small, roughly oval area, homogeneous in appearance, composed of dense connective tissue and showing very few partly degenerated nuclei. Close by, in a similar subsurface location, is (2) a small necrotic area separated from the surface by connective tissue and covering epithelium. A short distance from this necrotic area, going toward the tip of the papilla, is (3) another area of necrosis showing a deposition of calcium salts, yet still separated from the surface of the papilla by three or four strands of connective-tissue cells and covering epithelium. Still further toward the tip of the papilla is seen (4) a small depressed area devoid of normal covering, with irregular fragments of calcium salts deposited about its base. Apparently something has been torn away from this area, carrying with it part of the calcium plaque. In no place is there any evidence of infection, or of calcium deposits in the convoluted tubules.

This section pictures a most fortunate find, for from this papilla we removed a black stone and on it have demonstrated its attached plaque (Fig. 9). It is the specimen described which was analyzed by Dr. Richards to show a calculus of pure calcium oxalate, crystallized upon a plaque

of calcium carbonate and phosphate. Also, as just described, are demonstrable in this section an undisturbed subsurface calcium plaque, an area of necrosis as yet without calcium deposition, and the earliest changes of simple fibrosis with some pyknotic nuclei. *Here is written, for those who would read, almost the entire histology and pathology of the relationship between primary tissue damage in the renal papilla, succeeding primary deposition of calcium salts, and, finally, the crystallization on such of a primary renal calculus.*

Summary. The general impressions obtained by a close study of all our specimens are that there occurs a definite damage to the epithelial lining of the collecting tubules, and that the nearer one goes toward the tip of the papilla the more noticeable the changes are, and that there is a marked damage to the ground substance of the interstitial connective tissue and of the basement membrane of many of the collecting tubules. Here and there the ground substance is broken up and granular, and shows necrotic changes. These changes appear to be followed by the deposition of calcium salts and the gradual development of a calcium plaque. This study also reveals that in places the calcium is deposited in damaged epithelium of the collecting tubules, but the primary deposit appears to be in the basement membranes and leads to the formation of ring-like structures. No evidence of infection is seen in any of the sections presented.

PAPILLARY LESION TYPE II INTRATUBULAR CALCIFICATION OR NEPHROCALCINOSIS

In the 227 autopsies that showed visible calcium-salt deposition in the renal papilla, 23 cases belong in a different category from the simple calcium-plaque formation just described.

Pathology has long recognized a condition wherein the terminal collecting tubules of the renal papilla have been observed choked with undissolved crystalline deposits. The uric-acid infarcts of infancy are a well known example. The "calcium infarction" of Henle is less well known, while the nephrocalcinosis of Shelling and of Albright is a third pertinent example. The part that such pathological states play in the formation of primary renal calculi has been suspected by numerous observers (Huggins, 1933, and others), and in undertaking our autopsy investigations it was one of the possibilities that we held to be most likely of positive results. In our autopsy series the small percentage of such findings, as compared to the calcium-plaque formation, has caused us to omit its description in all but one of our previous publications. When re-

porting the results of these investigations to February 15, 1937 we had observed 5 examples of this tubular infarction. In 429 autopsies, or 1 per cent, as compared to the 17 per cent incidence of calcium-plaque formation in the same series. In the total series to date (1754 autopsies) 13 (0.7 per cent) examples of this second pathological papillary lesion have been observed.

The use of the term calcium infarction is to be regretted, for the condition as we have observed it, both macroscopically and microscopically, would be better termed calcium inspissation of the collecting tubules.

Grossly it is quite easily distinguished, as in every instance multiple papillary involvement was the rule, with each papilla streaked with yellowish lines converging toward the tip of the papilla, at which point the cribriform membrane is heavily impregnated with visible salt deposits. Dr. Greta Hammarsten (personal communication) has correctly described it, "where it presents something of the picture of the crystallization round the tip of a pipette having stood for a long time filled with a salt solution." In 4 instances the well known uric-acid infarction was identified, and in the remaining 9, calcium salts were the offending factor. In 1 remarkable specimen the tip of each one of six papillae (Fig. 13) supported a black secondary deposit of beginning stone formation, and in 3 other specimens small, soft, calcium phosphate stones adhered to the tip of the papilla (Fig. 14) and were definitely growing attached to such papillary tubular pathological matter. We have been able to obtain microscopic sections and to study the gross choking of each tubule with calcium-phosphate salts, to the appearance of true tubular inspissation.

In fact, this picture of gross tubular inspissation with calcium salts can be found in all varying degrees of tubular involvement, and from the drastic state above mentioned we have observed gradients of lesser involvement until, occasionally, one finds even a solitary tubule choked with calcium phosphate (Fig. 15). Twice we have observed such situated centrally in the papilla and forming a true intrarenal calculus. A third most interesting example was sent us for study by Dr. Roderick L. Huntress of Portland, Maine, which gave every evidence of a partial though decreasing obstruction to a single urinary channel. Similar isolated case reports are to be found in the literature (Crabtree, 1930; Huggins, 1933) in which varying degrees of nephrocalcinosis have been observed, both clinically and post mortem.

This calcium deposition is for the most part intratubular and in Henle's original description

he depicts it as a counterpart to intratubular uric-acid infarction of infancy a view later corrected and modified by Lohrlich to show that the calcium salts may be also extratubular and especially in the collagenic membrane.

Microscopic pathology. The microscopic picture, as we have generally observed it in autopsy cases, is a drastic one and in sharp contrast to the innocent appearance of the simple calcium plaque. Infection was present in 42 per cent of the autopsy cases (8 of 9) and one gained the impression that the infection was secondary and not primary. There is seen a marked fibrosis associated with degeneration and desquamation of the epithelial cells lining the collecting tubules. In all of our specimens this picture is quite generalized, and few or none of the terminal tubules escape involvement. Frequently the very tip of the papilla is necrotic, with diffuse calcium-salt deposits, and in 3 specimens in which stone was successfully sectioned it was found growing at the tip of the papilla as part of the gross picture of calcium deposition (Fig. 16). Cortex, glomeruli, and convoluted tubules show no noteworthy lesions.

That in our autopsy series this Type II lesion represents much smaller percentage than the calcium plaque is not at all illogical for the finding of stone has been, in relation to the finding of plaque 1 to 3.5, which shows that practically two-thirds of the instances of plaque formation are innocent of significance in forming calculi at the time of death. Of the 19 instances of the second papillary lesion 4 showed stone present. The lower incidence of the Type II lesion suggests that its cause is based upon some infectious, dietary metabolic, or glandular disturbances, which are comparatively rare in hospital discharges.

The hypersecretory state. One of the five pertinent theories for the etiology of stone presupposes disturbance in the normal colloidal mechanism of urinary excretion. The urinary colloids are recognized as holding in solution the crystalloids of the urine, and not only holding them in solution but in a supersaturated state. It is one of the many ingenious provisions of nature whereby it rids itself even under physiological conditions, of considerable amounts of excreted solid substances in the least possible quantity of fluid. The normal daily amount of colloid is gauged to be sufficient for the normal daily amount of crystalloid but it is a delicate balance and is, therefore, assumed to be quite unstable with a constant tendency to gain a more stable state by having the crystalloids fall out of



Fig 1 Roentgenogram of August, 1934 Shadow of right renal calculus observed when searching for cause of backache on left side



Fig 2 Roentgenogram of January, 1937 Shadow still present and little changed

suspension. If one disturbs this so-called colloidal balance by either increasing the crystalloid or decreasing the colloid surface area, a precipitation of crystalloids occurs and they appear in the urine as actual insoluble material.

It has been repeatedly demonstrated (Korhonen, 1936, Keyser, 1923) that the products of infection and of epithelial degeneration are recognized disturbers of the colloid mass, either by depreciating the amount of colloid or by causing coalescence with loss of surface area. Hammarsten and others have also called attention to the solvent properties of urea and the loss of such stabilization of salts when urea-splitting organisms disturb this chemical balance that exists in normal urine.

Three conditions, both experimental and clinical, come to mind in relation to the hyperexcretory state.

1. The experimental creation in animals of hyperexcretory states (Higgins, 1936, Keyser, 1923) in which by overfeeding, there is eliminated through the kidney more crystalloid than can be held in solution by the colloid, which results in the output of a urine in such a supersaturated state that crystalloids are verging on, or actually are, precipitating therefrom.

2. One now seems able to visualize that primary renal calculi associated with such a condi-

tion as hyperparathyroidism (recognized as a hyperexcretory state), present a similar picture and need little or nothing more to explain their etiology.

3. The nephrocalcinosis of Shelling and of Albright appears to reach exactly the same end by reason of infection with urea-splitting organisms.

The etiology of primary renal calculus in these cases seems of quite simple explanation, for here we have a disturbed chemical (or colloidal) balance and have an excreted urine supersaturated with precipitating crystalloids, and one visualizes the same picture of tubular inspissation and papillary infarction as we are describing under this title of Papillary Lesion Type II.

Simple as this seems to be to account for our need of an explanation, it still falls short in both argument and proof, and perhaps simple cystinuria can be used to aid our understanding. In the cystinuric patient we have an unquestioned hyperexcretory state, and repeatedly patients have been observed with otherwise bilateral normally functioning kidneys. Yet in such an individual a stone may form. Now it is known that only 27 per cent of the recognized cystinuric patients actually develop a renal calculus, but when it does occur, it is in but one of a pair of equally disturbed kidneys, and it arises in only one part (perhaps a minor calyx) of that one



Fig. 3. Urogram of July 1937. Shadow of stone in inferior minor calyx of right kidney.



Fig. 4. Urogram of September 1938. Twenty-four hours after onset of first right renal colic. The calculus is in the lower third of the right ureter and completely blocks right renal function.

kidney! Nothing could be theoretically more perfect to prove the necessity of an initiating lesion at the point of formation of such a stone. Such may be considered nature's infallible neglect by leaving behind one perfect clue to our subject.

The clinical importance and the relationship of this second type of papillary lesion to primary renal calculus becomes increasingly clear as one reviews the great mass of experimental studies wherein *hypersecretory states* are artificially produced. By saturating a animal's economy with overwhelming doses of either a natural or an unnatural salt, an hypersecretory state is created wherein a closely related salt appears in the urine far and above the ability of the urine to hold it in solution. Precipitation and crystallization may naturally be expected, and this papillary intratubular inspissation is the pathological picture which ensues. Likewise in those clinical conditions wherein an abnormal hypersecretory condition for calcium salts is recognized to exist, the relationship between such a cause and the primary renal calculus, as representing the effect must meet through the pathological agency of such a intermediary papillary tubular lesion, and it is our hope to be able to point out just this very fact in Part III of this study and to demonstrate why such precipitation occurs and what the

necessary factors to the location of its deposition are. However the one important fact at this point which must be constantly borne in mind is that a marked variation in the degree of the pathological condition occurs, and on this alone depends the damage to tubular epithelium, to the basement membrane and to the interstitial supporting tissue and, again, the varying gradients between damage repair and associated tissue calcification give a diversification of the clinical problem with which we are dealing.

Discussion. Our autopsy studies in man have uncovered these two types of papillary pathology both now recognized and proved as a distinct intermediary lesion between some causal condition and the resultant crystallization which call a primary renal calculus. This helps materially to answer those questions which until now plagued investigators in the rights of theorization, each of which served to push the answer farther from us and from clinical reasoning. We now understand how stone starts, where stone starts, and why stone starts. We now can visualize the reason for the absence of symptoms while stone attains growth. We now can account for the length of time required for growth. And I believe



Fig 5 Photomicrograph of a simple calcium plaque on the side of the renal papilla. Note that it is still covered by epithelium, and the absence of any evidence of infection



Fig 6 Papilla showing fully developed initiating lesion. To right is an enlarged photograph of a renal papilla with calcium plaques distinctly visible. To left another papilla from the same kidney, and on a plaque is seen a secondary black deposit. It is the earliest evidence of the beginning of a renal calculus

Now we can see our physiology, our pathology, and our crystallography in a more acceptable atmosphere.

The first postulate—that there had to be an initiating, or precalculus lesion—appears proved. The second postulate—that such a lesion would likely occur upon the renal papilla—likewise appears proved.

The finding of calculi composed of three different urinary salts, calcium phosphate, calcium oxalate, and uric acid, each crystallizing upon calcium plaques and in each instance composed of salts of a different chemical composition from that of the plaque on which it grew, allows one to ascribe to this lesion—the calcium plaque—the power to be the nidus on which any urinary salt may crystallize, and to so produce a common origin that may account for the known diversity of the chemical composition of urinary calculi.

Our Type II papillary lesion has not only been of rarer occurrence, but has also caused us greater trouble to rectify its pathology with both cause and effect. That primary renal calculi can arise therefrom we can vouch for, as we have observed 4 such cases. That it is more commonly associated in clinical cases with only the deposition of calcium phosphate seems true likewise, and thus places it in the clinical group associated with urinary stasis, infection, hyperparathyroidism, and hypovitaminosis A. Why we believe that these three causative conditions, though possible, are quite in the minority, we hope to show later when

studying the broad clinical subject of primary renal calculus.

The result of this research upon human autopsy material, while explaining the origin of primary renal calculi by demonstrating the morbid pathology of the human renal papilla, left unanswered the question as to why such papillary pathology occurred, and led us directly to institute further studies, now of an experimental nature in animals, to try to prove if any of the current theories in regard to the etiology of stone produced the types of papillary pathology with which we were familiar from our studies in man.

PART III RESEARCH ON THE PATHOLOGY OF THE RENAL PAPILLA PAPILLARY CALCIFICATION IN EXPERIMENTAL ANIMALS

Thus having proved that two types of initiating lesions have been found and that, in specific instances, they were directly related to the origin and growth of primary renal calculi, our interest next lay in trying to understand their cause and perhaps their relationship to the five theories intimately associated in clinical and experimental studies of the stone problem. The five pertinent theories for the causation of renal calculi, (a) stasis, (b) infection, (c) avitaminosis, (d) colloidal imbalance, and (e) parathyroid hyperfunction, were weighed against the evidence at hand. Stasis was again ruled out as playing no demonstrable part in the clinical studies of primary renal calculus in which we were interested. Colloidal chemistry, though fascinating in its theoretical possibilities, seemed most refractory both

as to a causal relationship to the lesion and to experimental investigation, though certain features in which it may properly play an important part have been referred to under the hyper-excretory state. It is to be assumed that colloidal chemistry and the so-called colloidal balance probably play a dominant rôle in the determination of which urinary salt shall crystallize and form the stone. The remaining three each of which has developed ardent advocates and has amassed an enormous literature, gave the greatest promise of being related to the deposition of calcium salts as seen in our papillary pathology and each was subjected to experimental study in a series of problems now to be presented and discussed.

RESEARCH STUDIES ON THE RÔLE OF INFECTION

In discussing the rôle that infection plays in the etiology of renal calculus, we enter a phase of the question in which two distinct schools exist: one positive that it is the hidden answer and cause; the other equally adamant that it is not. In order to view the subject clearly, let us strip it of its complicating features and states. Let us put aside those cases of calculus pyonephrosis in which pathology has existed so long or has

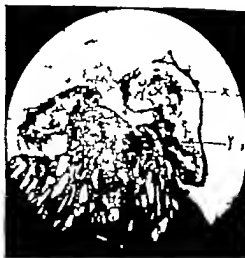


Fig. 8. Photomicrograph of section through specimen in Figure 7. The calculus (c) has been successfully decalcified and sectioned. It is directly attached to its plaque (p) and growing only therefrom. By differentiating stains the calculus has been proved to be calcium phosphate and the plaque different salt of calcium, probably the carbonate.



Fig. 7. Photograph showing the calculus upon renal papilla. Calcareous plaques on other papillae. This stone is of calcium phosphate.

progressed so far that the characteristics of onset are obliterated. Again let us set aside those wretched cases of chronic pyelonephritis with persistent alkaline urine and phosphatic deposits or incrustations, and with them the rapidly recurrent postoperative cases, most of which belong in the same category. I should like also to exclude the cases of long-standing calculus disease, judged by either history or size of stone, in which the entrance of infection becomes quite an unknown factor. All of which, again, is an attempt to limit this particular study to the primary renal calculus of recent acquirement, and to the experimental studies of recent years in which attempts were made to produce stone by means of bacterial agents.

There is little doubt that our kidneys are being bombarded more or less constantly by blood-borne bacteria, but the same is true of our other body organs, and we must realize that such bombardment is sustained with competent resistance and without tissue injury. Today we no longer believe that organisms pass innocently through the kidney or that there is such a thing as a passive or innocent bacteriuria. Again, we must also realize the now well accepted fact that, in the absence of obstruction and stasis, it is practically impossible to have a chronic infection of the human renal pelvis. So with these weapons the



Fig 9 Calculus which was found attached to a renal papilla and gently removed. The stone weighs 55 mgm and measures 3 mm across. The black portion has been analyzed and proved to be composed of calcium oxalate. The white portion represents the torn-out calcium plaque upon which the stone crystallized, and is composed of calcium carbonate and phosphate.

anti-infectionists arm themselves and stand ready to meet the attack of the large host who see in bacteria certain characteristics that seem to fit where certain links are missing in the chain of evidence to prove that the etiology of stone is of infectious origin. The evidences (1) that infection disturbs colloidal balance (Korhonen, 1936, Keyser, 1923), (2) that infection produces epithelial or bacterial clumps, upon which crystallization may occur (Eisenstaedt, 1931, Berke, 1937), (3) that infection may cause papillitis, even to ulceration (Aschoff, 1913, Pannett, 1915), (4) that bacteria have been demonstrated in, and cultured from, the center of calculi (Hrvntschak, 1935, Hellstrom, 1936), and (5) that the presence of urea-splitting organisms results in calcium-phosphate precipitation and incrustation (Hellstrom, 1929, Grossman, 1933, Eisenstaedt, 1931, and others) are all arguments to show the close relationship between an infectious state and the occurrence of renal stone. Likewise, one must mention, only to exclude, those frequent reports of the association of chronic infectious conditions and prolonged recumbency and immobility (Watson-Jones and Roberts, 1934, Lee-Brown and Earlam, 1933, Goldstein and Abeshouse, 1935, Costello, 1932, Joly, 1929, Higgins and Schlumberger, 1937, and many others), in which, however, the unnatural relationship of infection and postural stasis undoubtedly develops a predisposing cause that is quite aside for the moment from our problem of the primary renal calculus. From 1922 to 1925 Rosenow and Meisser presented extremely convincing evidence, when they performed their oft-quoted experiments on dogs, by

implanting streptococci obtained from the urine of a patient with typical attacks of renal colic due to calculus in the pulp cavity of the teeth, and having 5 of their 6 dogs develop renal stones. In fact, in a larger series of dogs so studied, 87 per cent (30 of 34 dogs) "revealed either calculi or localized lesions in the medulla, or both," when streptococci suspected of having specific renal affinity were implanted in dogs' teeth (Rosenow, 1925). Such a marked specificity of organisms is not generally recognized in medicine, and Hrvntschak (1935), a strong advocate of the infectious origin of stone, repeated this work and reported completely negative results. Certain it is that stasis plays no part in Rosenow's experiments, and the lesions of the medulla that he describes suggest certain observations which we have made and which are to be reported further on. It is surprising that Rosenow's simple method of producing focal infections at will has been so neglected, and one is permitted the thought that it has been used and unreported because of indifferent results. It is worthy of greater use and application. One is tempted, however, to give more weight to Rosenow's observations than has been credited to date, and though his enthusiasm may have carried his ideas too far afield, yet I believe proof will be forthcoming that will substantiate some of his observations relating chronic focal infection with the origin of stone.



Fig 10 Photomicrograph at edge of specimen shown in Figures 7 and 8. It shows the crystallization lifting the edge of the plaque from its papillary attachment, and it is thusly that a stone gains freedom.



Fig. 5. Roentgenogram of pure uric-acid calculus. It is the inclusion of an x-ray-positive nucleus or nidus. This nucleus has been analyzed and proved to be composed of calcium salts. This is taken as proof that the uric-acid crystallization took place upon and around this primary nidus, which must have been deposited in the renal papilla as a calcium plaque.

If primary renal calculus is the product of an infectious agent it would seem that when such a stone blocks the ureter and causes intense colic from pelvic distention the resultant trauma to the kidney (at times reaching a degree where renal function ceases and stagnation exists) creates the most perfect stage-setting for a rapid dissemination of the infectious process. For this reason I have taken 75 such cases observed practically consecutively in which open ureterolithotomy was necessarily performed and in which in each instance the pelvis urine was cultured at the



Fig. 6. Photomicrograph of fully developed lithiating lesion shown in Figure 5. Here the epithelial covering of the calcium plaque has gone, probably from pressure of the increasing deposit, and the plaque has a rough and balled appearance. The plaque has a rough and balled appearance. The pinked outer layer is of different color and character and is distinctly laminated. It is unquestionably a secondary deposit and of different chemical character. It is the earliest evidence of the beginning of primary renal calculus.

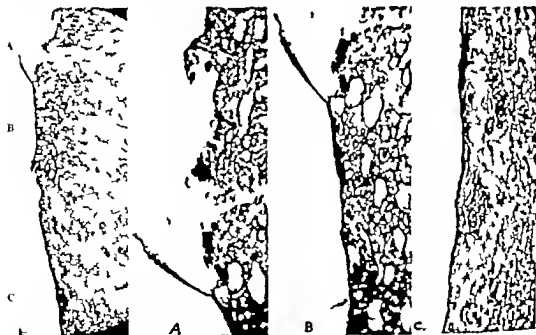


Fig. 7. All lesions on one papilla and section. At left a low power photomicrograph showing at A the area from which the calculus in Figure 5, as removed, at B sub-

surface calcium salt deposit or beginning plaque, and at C an area of ischemia and necrosis. Successive pictures are these three areas under higher magnification.



Fig. 13 Typical papillae (6) from one kidney showing Papillary Lesion Type II, "calcium infarction," or nephrocalcinosis. The interesting point is that each papilla has a secondary black deposit on its tip, reproducing in this Type II lesion what we have already illustrated in Figure 6 in the Type I lesion, i.e., the earliest evidence of beginning crystallization of a primary renal calculus.

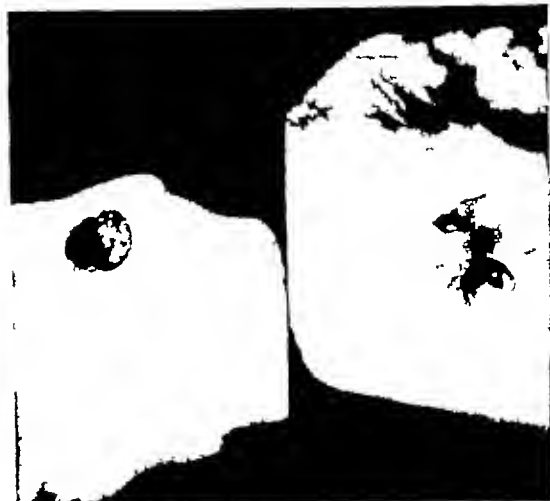


Fig. 14 Photomicrographs (low power) of the tips of two papillae illustrating Type II lesion. Each is snowy white from "calcium infarction," and on each is growing a primary renal calculus.

operation. These 75 cases, almost without exception, represent instances wherein the evidences and symptoms of the existence of stone were of short duration. Almost every one was suffering from his or her primary colic, and in no case were stones of large size (over 2 cm.) present. They were essentially cases of primary renal calculi in their first attack of ureteral colic, in which urography proved the stone too large and too high to expect further ureteral passage. I believe this to be a more accurate method than culture by cystoscopic catheterization, and in fact the great majority of these cases were not instrumented at all. In 36 patients, or 48 per cent, the pelvic-urine cultures were sterile, 31 patients had single and 5 had multiple calculi. In 39 patients, or 52 per cent, cultures of the pelvic-urine proved infection to be present, 34 patients had single stones and 5 multiple.

This percentage of 52 to 48 is certainly not conclusive, but under these ideal clinical conditions the 48 per cent of sterile pelvis is of greater significance in proving that infection does not play an essential rôle than the 52 per cent that were found to harbor an organism. Moreover, the organisms found present in those that were infected do not coincide with the expectations of the advocates of an infectious origin for stone.

The organisms found present were of 15 different identities and 6 different combinations of these, the staphylococcus albus 15 times, streptococcus 8 times, bacillus coli communis 8 times being the most frequent offenders. This makes 38.5 per cent proved of association with the staphylococcus albus, which is far from Hellstrom's 66 per cent, which he broadens to 75 per cent, and which allows him to state that "the essential cause of the formation of these concretions is undoubtedly the staphylococcal infection." In fact, Hellstrom meets with difficulties in interpreting his own observations, for he says in evaluating "the connection between staphylococuria and stone formation, examination of the ureteral urine is of great significance. This has been done in 67 cases." Then after an excellent tabulation he states, "In no less than 23 cases with unilateral stone, or almost one-third of the material so studied, there have also been staphylococci on the side where there was no stone. This suggests that the staphylococci are not the only determining factors in stone formation, but that there must be in addition other, especially local, conditions of the kidney and urinary passages." Also in 8 of his 67 cases (12 per cent) ureteral culture was sterile on the stone side, and in 3 further cases (4.5 per cent) no staphylococci could be demonstrated, but bacilli coli were present.

One does not wish to quote Koch's stipulations, but the large hiatus that exists between theory and fact has not been satisfactorily bridged by the

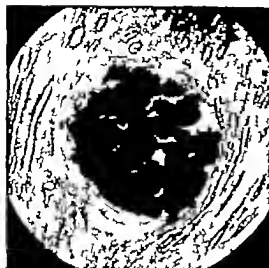


Fig. 5. Illustration of solitary tubule packed with calcium phosphate. This is found in the middle of the papilla and is probably purely obstructive. (Von Kowen stain) (Specimen from Dr. Roderick L. Huntress, *vid loc.*)



Fig. 6. Photomicrograph of the tip of papilla illustrating mainly tubular invagination with calcium phosphate (on Kowen stain) and supporting primary renal calculus of the same material. Decalcification for microscopic section cutting has dissolved some of the calcium phosphate. This is from specimen shown in Figure 4.

proponents of this theory who try to make the etiology of stone totally dependent on local infection.

Txin studies. The material from our autopsy studies, which demonstrated our calcium-plaque lesion, consistently failed to show (excepting 9 of 27 cases) the slightest evidence of infectious reaction in association with such lesions; there were no exudate, no round-cell infiltration, no necrosis, and no organisms. In fact, almost uniformly the evidence of infection was particularly conspicuous by its total absence and local infection of the papilla as a cause of such calcification was quite out of the question. From our studies it simply cannot be included. *The effect of bacterial toxin, however, was quite another matter* and as the lesion gave every evidence of being calcium deposition in response to some form of damage to the collecting tubules, there was the possibility that the concentration of some such toxic material at this point could be the primary cause. In the laboratories of the Abington Memorial Hospital a staphylococcus toxin was elaborated and we injected it into rabbits in a small series of experiments. This toxin proved to be too potent to work with accurately and the animals died promptly after the injection of 0.3 c.c.m. so a 1 to 10 dilution was prepared by the addition of 0.1 per cent of formaldehyde and incubation at 30 C. from twenty-four to forty-eight hours.

The experiments consisted of the intravenous injection of 5 c.c.m. of this toxoid, to be followed by simultaneous collection of blood and urine at frequent intervals over the following three or four hours for the titration of this toxoid content. It was to be assumed that the concentration of the toxoid in the glomerular filtrate would be the equal of that in the plasma and that somewhere along the renal tubules concentration of the toxic material would occur and we wished to find out if this could be observed.

In an experiment with a rabbit weighing 2700 gm., in which 5 c.c.m. of staphylococcus toxoid of L.B. 1 was injected intravenously, subsequent titrations proved that at the highest reading this toxoid was present in the urine in a concentration five times greater than in the blood stream at its maximum concentration at five and ten minutes after injection. This rabbit secreted 0.15 c.c.m. of urine per minute.

In a second similar experiment a rabbit, weighing 194 gm. was given an intravenous injection of 5 c.c.m. of the same toxoid of L.B. 1. This toxoid was recovered from the urine in concentration sixty times greater than that in the blood stream at its point of maximum concentration. This rabbit secreted 0.02 c.c.m. of urine per minute.

These examples, together with others, from our series of 10 similar experiments, seem definitely



Fig 17 The collecting tubules in a rabbit's kidney after the administration of a stable streptococcus hemolysin leucocidin. The damage to the tubular epithelium is marked

to prove that the kidney can and does concentrate this toxic material from two and a half to sixty times the blood-stream content. The tabulation and complete protocols of this experimental work have been reported by Dr Ezra Casman (1937).

This work has been repeated since its first publication by Dr Casman, and in our "Studies on the Pathology of the Renal Papilla" (1937), and similar results have been obtained. In 6 rabbits subcutaneous injections were tried, but failed to give evidence of renal excretion in recognizable amounts.

Through the courtesy of Dr Stuart Mudd, Professor of Bacteriology, University of Pennsylvania, we were supplied with some of his stable streptococcus hemolysin leucocidin, we desired to use it because it is a haptin and does not give rise to the formation of antibodies when injected into animals. It was injected into a small series of rabbits, as we wished to study histologically the effect upon the tubules of the kidney, and the following protocols are characteristic:

Rabbit 8, weighing 1,308 gm, was given 1 c cm. of a 1:500 dilution on each of three consecutive days. Death

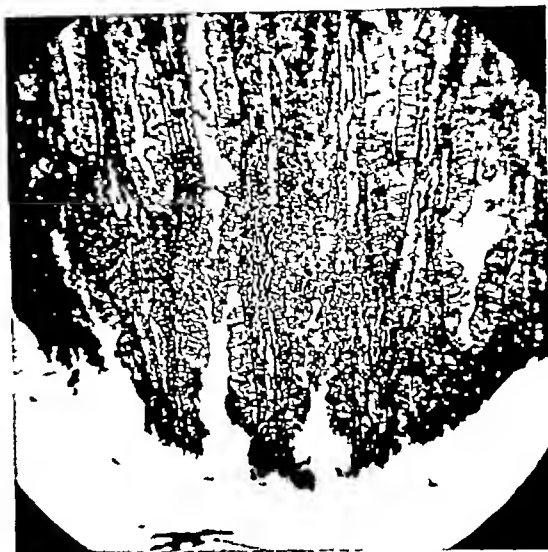


Fig 18 The tip of the papilla of a rabbit's kidney following the administration of a stable streptococcus hemolysin leucocidin, showing very advanced damage to all tubular structures

followed the third injection. Grossly the kidneys showed no noteworthy lesions. Microscopically there was cloudy swelling of the epithelium of the convoluted tubules and albuminous exudate into Bowman's capsule. The collecting tubules showed marked degenerative changes; the lining epithelial cells were necrotic and in many places desquamated; in other places the basement connective tissue was damaged. At the very tip of the papilla was an area of necrosis.

Rabbit 6, weighing 1,370 gm, was given eleven daily injections of 1 c cm. of the same preparation in a 1:250 dilution. The only lesions observed were microscopic and showed necrosis of a few cells in a number of the collecting tubules, with no lesions in the glomeruli or in the convoluted tubules.

All the control rabbits were entirely normal.

Such kidneys present conclusive evidence that damage has been suffered by the epithelium of the renal tubules and, though cloudy swelling is present in the convoluted tubules when high concentrations have been given, the greatest damage of all is in the terminal collecting tubules, in parts of which even epithelial exfoliation can be observed (Figs 17 and 18).

These experiments are of the utmost interest, and seem to prove three very important facts: (1) that the kidney does excrete bacterial toxins, (2) that the kidney does concentrate bacterial toxins while excreting them, and (3) that the elimination of a streptococcus toxin through the kidney can cause definite localized epithelial damage, which is most marked in the walls of the collecting tubules.

Naturally the concentration of any toxin in the urine varies inversely with the amount of urine excreted and this fact alone carries attractive therapeutic implications.

Relating this papillary pathology to the elimination of bacterial toxins caused us to wish to determine the result from the extensive administration of a simple chemical toxin realizing it well—following Richard's masterly work on the selective activity of the various parts of the renal tubule—that the location of insult may vary. A small group of rats were given uranyl acetate and the observations in 2 of them will suffice to illustrate the result.

Rat 47 received 1 two-day intervals of 5 mgm of uranyl acetate intramuscularly. Seven days after the first dose, and three days after the last dose, it was sacrificed. Microscopic study showed the epithelium of the convoluted tubules to be necrotic; the loops of Henle showed no noteworthy changes, except that one of them contained some intratubular calcium salts, the collecting tubules of the papilla contained casts and showed marked damage to the lining epithelium, tubular desquamation, but no calcium deposits.

Rat 48 received the same dosage as Rat 47, but was not sacrificed until ninety days after the last injection. The epithelium of most of the convoluted tubules had regenerated, though great many tubules showed lack of regeneration of the lining epithelium and were filled with irregular calcium salt deposits. The epithelial lining of the collecting tubules as regular though many cells contained siliculous material. The tip of the papilla showed marked increase of the intertubular connective tissue.

Assuming that both rats responded equally to the injections of uranyl acetate the time element seems to be the only explanation of the difference in the pathological picture in the kidneys of the 2. Rat 47 killed three days after the last dose showed extensive necrosis of the convoluted tubules and apparently not enough time had elapsed for the deposition of calcium salts. In the kidneys of Rat 48 killed ninety days after the last dose there were found extensive deposits of calcium salts in the necrotic epithelium of the convoluted tubules.

Discussion. From our observations, both gross and microscopic, on our autopsy material we have

been able to associate the initiating lesions of primary renal calculus with generalized or localized infection of the kidney proper or of the renal pelvis. This being an observed fact, it forces the unavoidable conclusion that such cannot be of further interest to us in searching for the etiology of renal calculus. But the relationship of infection to stone is too intimately associated in clinical medicine to be brushed aside so easily and for this reason the experiments with bacterial and chemical toxins were performed. We have de-

scribed the observation that each of these agents has caused localized damage to the renal tubules and their lining epithelium. As might be expected this damage varies with the concentration of the toxin, and likewise the reparative process is expressed in varying degrees of tissue regeneration. Only in the chemical-poison studies have we seen calcium-salt deposition in the tubules, but the bacterial toxin has been hard to control, though we can point to the similarity of cellular damage and infer, argue by analogy that repairation would follow similar lines.

I believe it safe to conclude that the demonstration of the localized damage to tubular structures by the administration of bacterial and chemical toxins that either the complete reparative process that follows an acute renal insult of such toxic nature or the kidney's reaction to a low grade but oft-repeated, toxic insult can be directly associated with tubular and intertubular calcium deposition, similar in every way to that which we have observed in man and described. The frequency and the degree of insult will account for the variations in the observed lesions and in all cases calcium deposition is to be recognized as a natural sequel to tissue insult and is comparable to calcification as seen elsewhere in the body under similar circumstances.

RESEARCH STUDIES ON THE RÔLE OF VITAMIN A DEFICIENCY

This ground has already been extensively covered but it was felt that our approach to it would be slightly different. In the first place we were interested to see if such hypovitaminosis could produce true calcium plaques as found in man. Secondly we wished to study less drastic pictures of hypovitaminosis than those reported in most experimental work and in so doing, to create conditions more nearly simulating possible clinical states. And finally we wished to study the locations in which calcium is deposited in the kidney as possibly bearing upon the initiating lesion.

It may be fairly stated that under this heading is now grouped the entire rôle of diet in stone formation. That a deficiency in Vitamin A is the prime requisite is also well recognized, and that such a deficiency creates a disturbance in the normal calcium-phosphorus ratio and produces marked changes in the epithelial lining of the urinary tract seems equally well established. The original work of Osborne and Mendel (1927) the feeding experiments of Van Leersum (1927) McCarrison (1931) How (1936) Higgins (1931) Wolfach (1937) Grossman (1933) and numerous others point to the unquestioned fact that hyp-

avitaminosis A (Vitamin A deficiency) is associated with specific changes throughout the body, and that no tissue suffers more severely than the epithelium lining the urinary tract (McCarrison). These changes consist first of areas of epithelial proliferation, seen especially in our specimens in the papillary-calyce angles, to be followed by degeneration and desquamation and, later, by keratinization. Certain authors have likewise associated Vitamin D with this picture (Wolbach, 1937, Bernheim, 1933, Gray, 1935, Livermore and Prather, 1933, Sakai, 1933) because of its well known effect on calcium and phosphorus metabolism, but its part seems limited to the observation that Vitamin D increases the incidence of urinary concretions when added to a Vitamin-A-deficiency diet in experimental studies.

Discussion of this theory must be confined to those factors known to be truly relevant. First, it is to be pointed out that the calculi which form under conditions of hypovitaminosis A are consistently made of one salt from those elements known to have their normal ratios disturbed, that is, calcium phosphate. Stones of uric acid, urates, or even calcium oxalate, do not participate in the picture at all. Experimentally, if the phosphorus is radically diminished in the diet, calcium carbonate can be made to crystallize, and occasionally calcium and magnesium phosphate have been observed (Keyser, 1938, Higgins, 1935 and 1937). Second, the alkaline urine is to be especially noted, it appears promptly after starting the diet and is of marked degree, and with it occurs a high incidence of urinary infection in the experimental animals. In most studies the incidence of calculus formation is practically equal to that of urinary infection, though Gray (1936) found 5 of 6 such renal calculi sterile, but remarks that the incidence of calculus increases with the incidence of infection. Higgins (1935) reports the interesting observation that acidification of the urine by drugs decreases the incidence of stone in animals on Vitamin-A-deficiency diets, which suggests the causal relationship of a persistent phosphaturia in these animals. Third, it is assumed that the earliest formation of crystalline material (calculus) is about desquamated epithelial cells acting as a nidus, and it is true that vesical stone is much more frequent (88 per cent) than renal stone (42 per cent), though neither makes its appearance until marked changes in the epithelium have developed.

In a previous paper (Randall, Eiman, and Leberman, 1937) we published the dietary techniques used, and the rat groups with their results as seen in our experimental studies to that

date.¹ The material was then incomplete, and some of the animals had not then been sacrificed. The first series consisted of 112 rats of Wistar Institute breed, and it is perhaps of pertinent significance that in the past these rats have shown themselves particularly resistant to the effects commonly caused by Vitamin-A-deficient diets. This is attributed to the high vitamin diet which they have been fed and to the storage of vitamins in their systems. As such they were ideal for our experiment, since their vitamin loss is gradual and the experiment follows a more typical clinical and chronic course. A second series, composed of 25 rats, have been added to the study. These were all the ordinary white laboratory rats, and each group was given Higgins' (1933) Vitamin-A-deficiency diet. In all, twenty different groups of rats were used, varying from 5 to 12 rats in a group, varying as to age, varying as to litter mates, and varying under five different dietary regimes. In our report in 1937 only about 60 per cent of the experimental animals had been sacrificed and, together with those which had died, were subjected to an autopsy, and studied. This was because we were killing the animals at specified intervals of time in order to observe both the early and the late lesions. These rats subsisted on this Vitamin-A-deficient diet for from forty-eight to one hundred and ninety-five days (an average of 108.2 days). We can now report on the entire study.

Pathology. It is to be emphasized that these rats were handled so as to make the experiment simulate as nearly as possible a clinical human group on a mild degree of Vitamin A deficiency, carrying it over as long a period of time as possible, and striving to produce not too drastic a state of hypovitaminosis. The great majority of the rats gained in weight during the first six or seven weeks of the study, though showing characteristic signs of Vitamin A deficiency—weakness, xerophthalmia, and loss of hair. Later cachexia became progressively marked, and often a little cod liver oil was given to distinct advantage. Eighty-five rats in all lived more than one hundred and thirty days, and practically only in these were kidney changes at all consistent.

Five rats developed bladder calculi, their autopsy studies being made on the one hundred and second, one hundred and twelfth, one hundred and nineteenth, one hundred and nineteenth, and one hundred and fortieth days of their experimental diet, and it is to be noted that the kidneys in each of these rats were studied es-

¹This study was made possible by the courtesy and co-operation of the Wistar Institute of Anatomy, University of Pennsylvania.

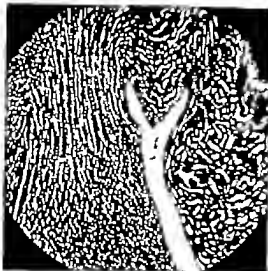


Fig. 9. Earliest evidence of calcium-salt deposition in rats on Vitamin-A-deficient diet. This is in the calyctine wall high in the calyctine fornix, and it is subsurface. Further down this calyctine wall is found epithelial proliferation leading to keratinization.

pecially, and considered negative for any evidence of calcium deposition.

Microscopically the kidneys of rats living more than one hundred and thirty days began to show increasingly marked enous engorgement, at times so extreme as to prevent engorgement of all the small renal vessels, at times true hemorrhage into the pelvic tissues, and once there was observed rupture and hemorrhage into the pelvis at the papillary-calyctine fornix.

From one hundred and forty days onward the characteristic keratinization of the epithelial lining of the pelvis became increasingly evident. It generally appeared first on the calyctine wall high in the fornix, and was unassociated with any evidence of infection or actual tissue degeneration. Still older rats showed in 4 specimens a true aseptic ulceration, three times of the calyctine wall and once on the papilla but definitely without evidence of bacterial invasion. It was perfectly evident that the epithelium lining the renal tubules suffered in the progressive avitaminosis. In the convoluted tubules the lining epithelial cells were seen to be swollen, ragged, and in varying stages of degeneration. The collecting tubules showed enlarged lumina, with cells in differing stages of degeneration. Throughout all sections were seen hemosiderin deposits and congested vessels, giving evidence of long standing vascular engorgement, even to microscopic hemorrhages.

The damage seemed to be most marked at the base of the pyramid where collecting tubules begin and convoluted tubules end, and where in the rat the line is well demarcated and the interstitial supporting tissue normally increases in amount from this point throughout the pyramid. The maximum damage was at this point, but continued on down the collecting tubules to the tip of the papilla. Throughout this area could be seen an increase in young connective tissue cells, congested vessels, small hemorrhages, and hemosiderin deposits. One could find vascular endothelial cells which likewise showed evidences of having suffered injury even to the capillaries in some of the glomeruli.

Calcium-salt deposition was most carefully studied. It first appeared in rats sacrificed at one hundred and forty days (on Higgins Vitamin-A-deficient diet), became increasingly evident in those studied after one hundred and fifty-four days, and in all rats sacrificed after from one hundred and sixty to one hundred and ninety-five days increasing amounts of calcium-salt deposition were present.

The location of the calcium-salt deposition was extremely interesting. It first made its appearance high in the calyctine fornix, associated perhaps with early epithelial changes, but distinctly under the lining epithelial coat (Fig. 19). Subsequent deposits occurred in the convoluted tubules in the region at the base of the papilla, and apparently where the papillary-medullary junction changes the entire structure of the tubules with increasing connective-tissue stroma. In those rats longest in the condition of hypovitaminosis the tubules of the papilla became choked with inspissated intratubular calcium salts (Fig. 20). In some specimens, in which epithelial damage was marked, calcium salts were found in the base membrane and in places the supporting intertubular tissue was found invaded (Fig. 21). But nowhere did we observe a true calcium-plaque formation, or did any rat develop true renal calculus.

Discussion. Our studies with hypovitaminosis A have failed to reproduce any lesion even suggestive of the papillary lesion Type I, i.e., the calcium plaque.

All the microscopic studies have shown that though the earliest evidences of calcium-salt deposition are in the region of the base of the papilla and in the papillary-calyctine fornix, they are at the same time essentially intratubular deposits. A later stage shows an increasing majority of the collecting tubules of the papilla heavy with calcium-salt deposits, and a beginning deposition

in the tubules of the medulla and cortex. The final stage is reached when intraglomerular calcium is observed.

This points clearly to the conclusion that when primary renal calculus occurs as the result of Vitamin A deficiency, it must have its origin from the papillary lesion Type II and is definitely related to the nephrocalcinosis of a hyperexcretory state. We are rather prone to concur with the conclusions of the Council on Pharmacy and Chemistry of the A. M. A. (1935) that "A-avitaminosis does not appear to play a significant part clinically in urinary lithiasis." This agrees with both our autopsy studies and these rat experiments, for our rats on gradual and prolonged hypovitaminosis A did not develop primary renal stone, did not develop calcium plaque, and only produced the Type II papillary pathology that is quite infrequent (19 per cent) in the autopsy studies. There can be little doubt that under drastic experimental conditions calcium-salt deposits occur, and that stone can be made to develop, but in our rats on prolonged, slow hypovitaminosis the picture is one of definite renal engorgement and epithelial damage, both to the pelvic wall where keratinization develops and to the tubule lining cells where degenerative changes and repairs are observed. Tubular deposits of calcium salts follow and may be quite extensive, and finally calcification of tubule walls and scattered interstitial deposits appear.

RESEARCH STUDIES ON THE RÔLE OF HYPERPARATHYROIDISM

Known to medicine for many years as von Recklinghausen's disease, osteitis fibrosa cystica has been recognized only within the past decade as due to disturbed parathyroid function. First suggested by Askanazy in 1904, the association has been clearly established through the classical observations of Mandl (1926), DuBois et al. (1930), and Ballin (1931), to be still further substantiated by the brilliant studies of Aub, Bauer, and Albright and their co-workers in Boston (1934).

The basic observations prove that hyperparathyroidism is usually due to a functioning adenoma of the parathyroid glands. In some cases there appears only a hyperplasia of the parathyroid tissue. The result in either case is an increased production of the parathyroid hormone and an associated disorder in the metabolism of calcium and phosphorus. This disturbance becomes clinically recognized by an increase in the serum calcium level, or hypercalcemia, a decreased serum phosphorus level, or hypophos-

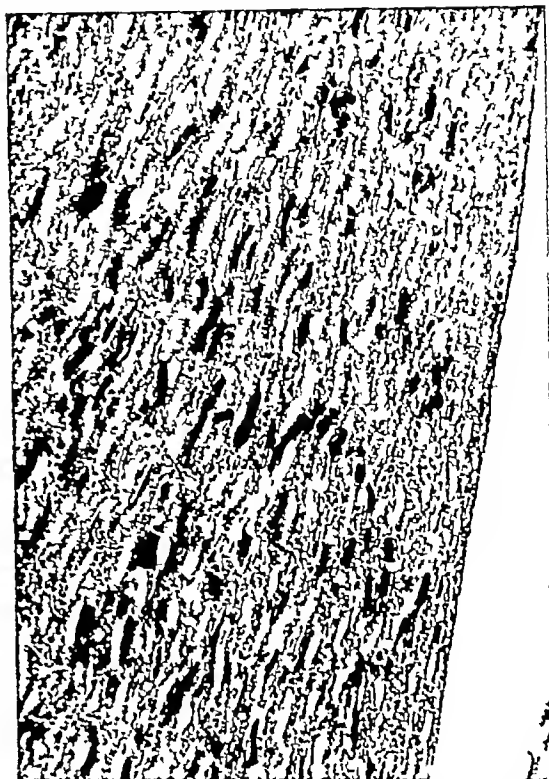


Fig. 20 Rat's renal papilla in late stage of Vitamin-A deficiency, illustrating tubular damage and marked inspissation of calcium phosphate.

phatemia, and an increased excretion of both elements in the urine, i.e., hypercalciuria and hyperphosphaturia. There occurs what MacCallum many years ago termed a "calcium diabetes," though today some consider hyperparathyroidism as a generic term for a disorder of the calcium-phosphorus metabolism, the diagnostic criterion of which is basically a hypophosphatemia with a hyperphosphaturia. Albright, Bauer, Clafin, and Cockrill (1932) spoke of primary hyperparathyroidism as a disorder based upon an idiopathic parathyroid adenoma, and secondary hyperparathyroidism as a functional hyperplasia secondary to the subsaturation group of bone diseases, with the urine in either case becoming supersaturated with calcium phosphate. Albright pointed out—and it should not be lost sight of—that if a calculus "is the result of hyperparathyroidism, it should contain a large amount of calcium and phosphorus." In the series reported by Albright et al. renal stone occurred in 28 per cent of the cases of proved hyperpara-



Fig. Terminal stage of calcium deposition in Vitzthum-A-descendent rat. All tubular epithelium damaged and calcium phosphate deposited into cellular membrane.



Fig. Calcium plaque in all of renal papilla of dog (No. 9) after 65 days of parathyroid hormone administration. Rather diffuse calcium-salt deposition throughout papilla.

thyroidism i. e., 23 times in the series of 83 cases which he collected from the world's literature. This figure varies in the literature from 8 per cent, as reported by Rankin (1935) to 61 per cent, as reported by Colby (1934) from the Massachusetts General series. Looked at from the broader field of the actual occurrence of renal stone Barney and Mintz (1936) could attribute but 5 per cent of 300 cases of renal lithiasis as due to proved hyperparathyroidism and the wide variation in these figures is further disturbed by recent studies reported by Griffin, Osterberg and Braasch (1938) in which a review of 1206 cases of renal lithiasis, only (0.18 per cent) could be proved as due to hyperparathyroidism, and these authors urge that even when high value of blood calcium or phosphatase is present patients with urinary calculi should undergo a thorough investigation for some other co-existent pathologic condition than hyperparathyroidism.

The rapid strides which many studies have made in this field have undoubtedly uncovered every pertinent relationship between the occur-

rence of primary renal calculus and the hyperfunction of the parathyroid glands. Quick and Hunsberger (1931) and Wilder and Howell (1936) believe they have shown a relationship between Vitamin D deficiency and parathyroid hyperplasia and that under normal conditions the maintenance of the normal calcium level in the blood is under the dual control of Vitamin D and the parathyroids, the former aiding in the absorption of calcium from the intestinal tract, the latter in mobilizing the element from osseous tissue.

We wished to trace in animals, given parathyroid hormone a point of hyperparathyroidism, the relationship existing between this condition and the possible occurrence and character of infiltrating lesions in the renal papilla for stone. Mandler and LeFebvre (1933) had followed this idea on male guinea pigs, administering subcutaneously 10 units daily for four weeks, and creating daily a temporary urinary stasis by elastic bands on the penis. At a autopsy all animals had dilated bladders, animal had dilated ureters, 3 animals had crystalline deposits in the renal pelvis and all animals had calcium excretions in the renal tubules and some trophy of the lining epithelium. Huepner (1937) J. E. et al. (1931) and Moehlig et al. (1935) had all observed renal calcification on the administration of parathyroid extract. Cantarow, Stewart and Howell (1938) had also followed this line of thought, using 6 adult dogs though their efforts were in

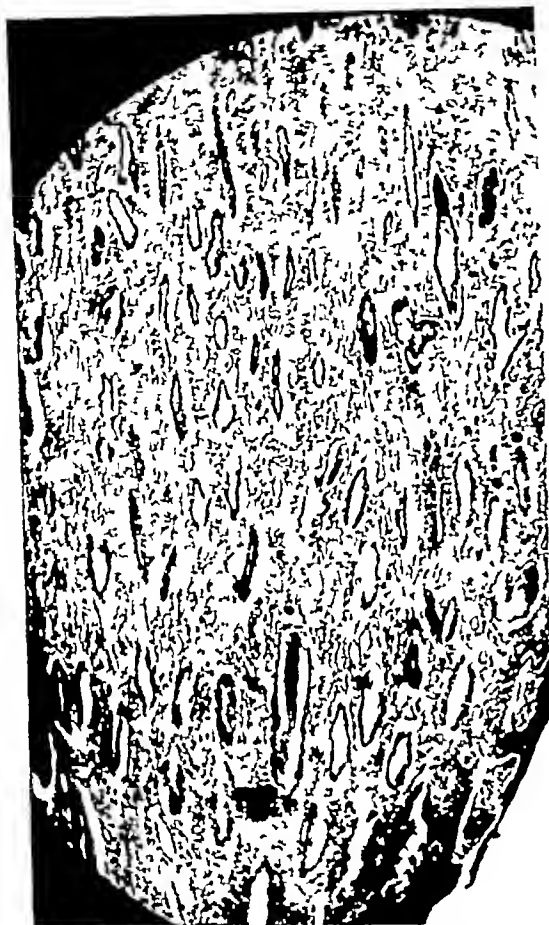


Fig 23 Photomicrograph of calcium plaque on renal papilla of dog after parathyroid hormone administration. Note scattered tubular calcium salts and damage to tubular epithelium



Fig 24 Drastic tubular damage and calcium salt deposition both intratubular and intertubular after parathyroid hormone administration in a dog

create an acute condition, and large doses (2,700 to 3,500 units) were administered over a period of seventy-two hours. They observed swollen and edematous kidneys, and degenerated tubular epithelium which was necrotic in parts. There were extensive deposits of calcium "chiefly in the cells of Henle and the convoluted tubules."

We were desirous, in our approach to the experiment, to simulate a slow, chronic effect, and for the purpose were supplied by Eli Lilly & Company with their preparation, Parathormone. We chose dogs as the best experimental animal. The details of our first series were published in 1937, and may be summarized as follows:

Fifteen dogs were used, and daily administrations were given subcutaneously, at times the

doses were as high as 500 units. Weekly blood chemistry studies were made, and when possible, urine estimations for the calcium output were recorded. When the animals appeared to be losing ground, a rest period of from seven to ten days was allowed, and almost all received some viosterol in their daily food at selected intervals. This regimen was kept up from four to six months, and from two to three months after the start one kidney was removed from each animal for control study and, likewise, to concentrate the effect upon the remaining organ.

Elevation of the blood calcium on this regimen was at times difficult to obtain and still more difficult to sustain, though figures of from 12 to 15 mgm per cent and, in a few instances, 17 to 19 mgm were recorded. The kidneys removed in the middle of the experiment were all completely negative, both macroscopically and microscopically. Of the remaining kidneys, on which the dogs lived while the experiment was continued for from two to three months longer, 1 was completely negative, though a bladder stone was present, and 7 showed microscopically scattered deposits of calcium salts. This calcium was found rather uniformly distributed throughout cortex, medulla, and papillae, and, for the greater part, could be recognized as intratubular deposits, though some



Fig. 5. Cortical calcium salt deposition in case of human hyperparathyroidism.

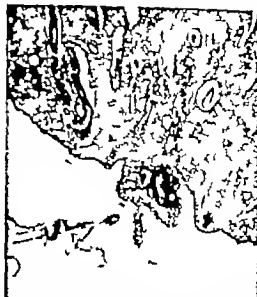


Fig. 6. Papillary calcium salt deposition in case of human hyperparathyroidism. Not dissimilar to experimental dogs, and damage to tubular epithelium also that calcium salts are deposited throughout cortex, medulla, and papilla.

damage to tubule lining cells, with at times calcium deposition in and under same could be found.

We reported that in 1 dog, in whom a six-month period of administration was accomplished and who had received in this interval 6,240 units of parathyroid extract (parathormone) we observed a typical calcium plaque identical to our Type I lesion as observed in man in our autopsy series, but there was no evidence of stone growth therein, for it was still subsurface (Fig. 5). Of course it was quite presumptive to ascribe to the administration of the parathyroid extract the entire etiology of this bone lesion, as primary renal calculus in the dog is not unusual (we have observed a unique case with stone attached to the papilla) and this plaque might have been but fortuitous observation.

But our first series left much to be desired, and it was decided to repeat the work with certain details for closer observation. Our second series comprised 16 adult dogs, and treatment was started September 23, 1937 and ended May 4, 1938. Daily injections of the same preparation—parathormone—were given subcutaneously. A small dose calculated on the animal's weight and varying from 5 to 20 units, was used at starting. This dosage was gradually increased at intervals as tolerance became evident, but again rest periods of a few days were necessary occasionally

to offset overadministration. Most dogs are receiving around 600 units daily as they approached the end of their experimental time.

Extensive clinical records and post-mortem studies were made by Dr. Paul R. Leberman of the Urological Staff, University of Pennsylvania, who conducted these experiments in the Department of Research Surgery, all of which are to be reported elsewhere by him. The kidney pathology alone interests us here. Whereas in the first group of dogs we sacrificed one kidney in the mid-experimental period, to find them all macroscopically and microscopically negative in this second group of dogs we allowed both kidneys to remain until the autopsy but in each instance took one for microscopic study and the other for special alizarin calcium staining and clearing of the specimen by the modified Schultz method. The latter was done in the hope that it could demonstrate usually the location of calcium deposition in the kidney in an entire specimen.

Gross pathology. At autopsy renal congestion was usually marked, and grayish striations were visible on sectioning. The renal papilla appeared especially hyperemic, and in several (7) specimens papillary deposits suggestive of calcium-salt deposition were macroscopically visible. Ten dogs in this series had bladder calculi at autopsy but

none showed any calculus, gravel, or even sand in the renal pelves or in the ureters

Microscopic pathology Eight of our 31 dogs died from some extraneous cause within three weeks of starting the parathormone administration. Nevertheless their kidneys were studied, and each was negative for any evidence of epithelial damage or calcium-salt deposition. Of the 23 remaining dogs, in which administration had been carried on from one to six months, all but 1 showed excessive amounts of calcium salts as intratubular deposits. The 1 exception is unexplained, but interesting, for treatment had extended for four months, but at no time was the blood calcium recorded higher than 12.3 mgm per cent. The degree of renal calcinosis varied markedly among the dogs, and it appeared to be most pronounced when the animal succumbed or was sacrificed at a time when the hypercalcemia was high, and it is to be supposed that during a regression in the amount of blood calcium the kidneys may rid themselves of some of their tubular deposits.

In this second series again 1 dog (No 294) showed a suspicious papilla which, on microscopic study, revealed a calcium plaque identical to our human specimens (Fig 23). The glomeruli showed no noteworthy lesions. The lumina of the convoluted tubules were enlarged and contained granular detritus, the lining cells for the most part were damaged and desquamating. This was true also of the lining epithelial cells of the collecting tubules, which gave the impression that the primary insult had been an epithelial-cell damage from some toxic agent. The lumina of many tubules were filled with inspissated calcium salts, while here and there were seen small calcium-salt deposits in the interstitial tissue. A typical superficial, but subsurface, calcium plaque was near the tip of the papilla and extended completely across the low power field of the microscope. There was no evidence of infection present.

Of the remaining dogs' kidneys 79 per cent showed calcium-salt deposition, and like in the description just given, it occurred rather uniformly deposited, though in differing amounts, throughout the cortex, medulla, and papilla. Some collecting tubules with intact but compressed epithelial lining show their lumina filled with calcium salts. Other tubules, again filled with calcium salts, show no remaining trace of their lining epithelial cells, but show deposition of calcium salts extending into and beyond the basement membrane. In the most advanced specimens calcium deposits can be found even in Bowman's capsule (Fig 24).

As we have had the privilege of studying 3 human cases at autopsy, in which hyperparathyroidism was part of the clinical diagnosis, with confirmation at necropsy, brief résumés of the renal findings are incorporated here, through the interest and co-operation of Dr John Eiman. They lend direct substantiation to the animal evidence that damage to the epithelial cells must precede true calcium-salt deposition outside the tubule lumina, and that, lacking such damage, the only deposition occurs as a calcium-salt inspissation within the undamaged tubules.

CASE 1 Female, age 46 Bryn Mawr Hospital (kindness Dr Struma). Adenoma of inferior parathyroids. Blood calcium 26 mgm per cent, phosphorus 3, blood urea nitrogen 51, phosphatase 4 i units (normal), total plasma protein 2 gm, albumin 5, globulin 5.2. The kidney showed grossly no noteworthy lesions. Microscopically, there were a few small collections of round cells in the cortex, and occasional hyalinized glomeruli. Bowman's capsules were slightly thickened. Nuclei of glomerular tufts were prominent and slightly increased numerically. A few glomeruli showed broken down tufts and escape of red cells into the space of Bowman. The arterioles and smaller arteries showed swelling of endothelial cells, and the larger arteries revealed early arteriosclerotic changes. The proximal parts of the renal papillae showed moderate increase of interstitial connective tissue and obliteration of some collecting tubules. Most loops of Henle and open collecting tubules showed retrograde changes in the lining epithelial cells, and partial or even complete desquamation. A few of the loops of Henle and the collecting tubules showed their lumina filled with amorphous calcium salts, while the lining epithelial cells of the tubules were compressed but otherwise showed no changes. This obviously is a case of simple inspissation or precipitation of calcium salts in the uriferous tubules without any pre-existing damage to the lining cells. Lumina of other tubules filled with calcium salts showed almost complete destruction of the lining epithelium and the presence of calcium salts in and beyond the basement membrane. Calcium salt was also seen in the convoluted tubules, in which at best only fragments of the lining epithelium could be demonstrated. Here and there small deposits of calcium salts were seen in the interstitial tissue, which is especially the case near areas of round cell infiltration. The glomeruli and the capsules of Bowman showed no calcium salt deposits.

From a study of this specimen it becomes apparent that the calcium deposits occur in (1) the lumina of the loops of Henle and collecting tubules with fairly normal epithelial lining, and (2) in apparently damaged or necrotic epithelial cells of convoluted tubules, their basement membranes, and interstitial tissue.

There is definite evidence in this specimen of renal damage by some unknown toxic material. The changes in the glomeruli and tubules have been described. Further, the presence of round-cell infiltration is definite evidence of the action of an irritant. It would appear that the action of the toxic substance, by damaging the lining epithelial and interstitial tissues, predisposed or facilitated

the deposition of calcium salts. The few loops of Henle and collecting tubules with comparative normal lining of epithelial cells containing calcium salts represent simple inspissation (calcium infarction). *It is felt that it is safe to assume that if a toxic agent had not damaged the cellular structures before the occurrence of hypercalcemia, all the calcium in the kidney would be found inspissated in the lumina of the tubules.*

CASE 2. Female, age 37. Abington Hospital. Bone cyst in the acromion process of the scapula, calcium absorption of long bones and skull; marked hyperplasia of all four parathyroids. Kidney arterio-sclerotic nephrosclerosis, chronic glomerulonephritis, tuberculous pyelonephritis and marked calcareous deposits in non-calcareous areas. Phosphatase 5.2-6.5; blood urea nitrogen 26-45; chlorides 472-645; carbon dioxide 4-5.5; phosphorus 2.7—total base 27—55; calcium 4-9.5.

Microscopic study of the kidney showed all of the glomeruli near the tuberculous areas either partially or completely replaced by connective tissue, and showing deposits of calcium which assumed the shape of the glomerulus or ring like cellular debris in the central part. The further away from the active tuberculous foci, the more normal the glomeruli were, so that some of these showed no noteworthy lesions. However, there were exceedingly few normal or near normal glomeruli, which accounts for the marked renal dysfunction. Calcium deposits were seen in the convoluted tubules, and the tips of the papillae had been destroyed by the tuberculous process.

From the study of this specimen it is very striking that the nearer the glomerulus is to an active tuberculous focus, the more marked are the calcium-salt deposits, or conversely the further the glomerulus is from an active tuberculous focus, the nearer normal it is in appearance. It is safe to state that the action of toxic material (in this case toxins liberated by the tubercle bacillus) predisposes to the deposition of calcium in the glomeruli and their capsules.

CASE 3. Male, age 60. Abington Hospital. Hyperplasia of all four parathyroids—combined eight 43 gm. chronic glomerulonephritis, decalcification of small long bones, hands, and feet. Blood urea nitrogen 30-60; plasma carbon dioxide 35; calcium 0.8; phosphorus 8-9. Kidneys grossly 45 and 60 gm. typical chronic glomerulonephritis.

Microscopic study of the kidney revealed advanced chronic glomerulonephritis. Here and there were seen few round cells. Many glomeruli had been converted into connective tissue masses. A few glomeruli showed partial hyalinization, and very occasional one approached the normal. The partially damaged glomeruli showed the great calcium-salt deposits—some calcareous salt deposits were seen in what seemed to be remnants of collecting tubules, and small amounts occurred in the interstitial connective tissue. The papillae showed marked fibrosis, obliteration, and cystic dilatation of many collecting tubules, and calcium salt deposits everywhere (Figs. 3 and 70).

DISCUSSION. From these experimental studies on dogs, and from the pathology observed in the

3 human cases of hyperparathyroidism, it becomes quite evident that some damage to the epithelial cells lining the renal tubules precedes true calcium-salt deposition in this condition. That this damage may even extend to the intertubular connective tissue structures seems likewise proved. Of especial interest is that in 2 of these experimental dogs we have been able to reproduce the calcium-plateau formation of the human kidney and only in this parathormone study have we observed both Type I and Type II papillary pathology, which our autopsy material has already related to the development of primary renal calculi. Hanes (1939) in a recent article states that tissue necrosis unquestionably precedes the deposit of calcium in hyperparathyroidism, and quotes both McJunkin, Towner and Bruhaus, working with rats, and Cantarow, Stewart, and Hoemel using dogs, in making similar conclusions.

I believe it to be true that some of our experimental dogs had only tubular inspissation of calcium salts, and that such is to be interpreted only as evidence of the hypersecretory state, and in such cases this material may wash out if the hypercalcemia decreases. However when actual tissue damage occurs, and calcium salts are deposited therein as part of nature's effort to repair such injury, then the permanency of this pathological picture does not change.

CONCLUSIONS

H. G. Wells many years ago stated that "in mammals only one normal tissue is the site of calcium infiltration—the developing bone while y tissue may become calcified, provided its vitality is reduced sufficiently and that it remains long unabsorbed and again, in calcification we have deposited in dead tissues, or any tissue of low vitality a considerable quantity of inorganic calcium salts, which appear at first in granular form, although later there may be more or less fusion and resulting areas of homogeneity."

From the material herein presented it becomes evident

That in the absence of stress, primary renal calculus is dependent upon and arises because of a pathological condition of the renal papilla.

That the pathological condition is a varying degree of damage to the structures of the collecting tubules and the supporting interstitial tissue.

That this damage is succeeded in the living by attempted repair in which process calcium salts may be deposited.

That such calcium-salt deposition may be both intratubular and extratubular and of varying

degree, in some cases, slow, discreet, and chronic, in others, acute, rapid, and overwhelming

That from our autopsy studies two types are distinctly discernible, to wit Type I, a calcium plaque with a predominance of interstitial deposition, and evidencing a slow, chronic process, Type II, an intratubular deposition giving the picture of a more drastic process and a more rapid accumulation

That in Type I calcium carbonate and calcium phosphate have been identified, and it is suggested that calcium nucleinate may make up the remainder

That in Type I calcium-salt deposition is most frequently on the side wall of the papilla, and remains innocent of any part in the causation of stone until growth and pressure (decubitus) brings it to the surface of the papilla

That when such a calcium plaque does become exposed on the surface of the papilla, it is then bathed in calycine urine and, acting as a foreign body, becomes the nidus upon which any urinary salt may crystallize

That calcium-phosphate, calcium-oxalate, and uric acid calculi have been identified in such origin and growth, and it is to be expected that other salts will be so identified in the future when technical difficulties are overcome

That on this pathological basis it can be recognized how a stone gains an opportunity to grow and also to remain asymptomatic over long periods of time

That when a calculus is extruded, there is evidence presented that such is accomplished by the tearing of its foundation of calcium-salt deposit from the papilla

That in Type II the calcium salts are principally intratubular and may present all gradations from simple tubular inspissation to drastic choking of the tubules and marked tubular damage, with some interstitial deposition in advanced cases

That in Type II only calcium phosphate has been identified in the tubular process and only calcium-phosphate calculi observed to form thereon

That in the Type II lesion the picture is that recognized as calcium infarction of the papilla, and any stone formation occurs at the papillary tip where the morbid process is most advanced

There are presented the results of 1,154 post-mortem studies, wherein Type I lesion has been observed in 19 per cent, and Type II lesion in 19 per cent, and wherein 65 examples of calculus growing adherent to the renal papilla have been observed

There is new evidence presented from studies on rabbits that the kidney secretes toxins, that the kidney concentrates toxins, and that, as a result, damage to the epithelial cells lining the collecting tubules of the papilla occurs. In this study repair by calcium-salt deposition has not as yet been observed, and difficulty has been experienced in minimizing the toxic insult for prolonged effect and study

There is evidence presented from studies on 112 rats on Vitamin-A-deficiency diets that the renal tubule epithelium suffers primary damage, and, in advanced stages, secondary calcium-salt deposition occurs

There is evidence presented from 3 human cases of hyperparathyroidism and 32 experimental dogs to which parathyroid hormone was administered to show that in this condition the initial renal damage is to tubule epithelium, and that it precedes the characteristic calcium-salt deposition

It is to be pointed out that in none of these studies, entailing a vast amount of histological material, has local renal infection manifested itself, with the exception of 8 cases from the autopsy series exemplifying the Type II lesion and 9 cases of the Type I lesion

Therefore, the following conclusions are offered

That in the course of its normal function the kidney suffers insults from many directions, and the greatest damage therefrom occurs in the convoluted and, especially, the collecting tubules of the renal papilla, where the greatest concentration of both normal and abnormal urinary elements occurs. That from these research studies we have been able to prove that primary renal calcification is a repair response to certain morbid states in the renal papilla, that damage to the epithelial cells lining the renal tubules occurs early, and that this damage is the prime essential to the subsequent permanent deposition of calcium salts. That one must bear in mind constantly that the degree of damage and the degree of calcinosis are extremely variable, both in amount and in location, and may be from quite variable origins. That if such calcium-salt deposition is extensive and progressive at some point, it reaches the surface of the papilla, and it then becomes bathed in calycine urine and acts as the nidus upon which urinary salts begin to crystallize

It may be suggested that the salt deposited as a calculus will be the one most ready to crystallize out of solution, be that due to abundance, to disturbed colloidal balance, or to the poorly understood laws of crystallization. Here we have for the first time a common origin for the diversification of chemical constituents of the composi-

tion of stone. Here we have an explanation of *where* a stone forms, *why* a stone forms, and *how* a stone forms, and also an accounting for the static and asymptomatic state during which a stone slowly gains growth.

And, finally, now as we have learned to consider stone as only a symptom of some preceding pathology again it appears that any type of calcium-salt deposition in the renal papilla is only incidental to an antecedent (tissue) damage which, in its turn, may arise from various sources, and that several concurrent factors are always required in the formation of a renal calculus.

Treatment. From published reports hyperparathyroidism may be expected to account for not more than 5 per cent of the clinical cases of primary renal calculus. That hypovitaminosis A can be responsible is to be recognized, but in modern civilization it probably can account for but a small portion of the remaining 95 per cent, and we would be generous to credit it with as much as 10 per cent of the cases of primary renal calculus. It is the belief of the author that the products (toxins) of distant focal infection play a very major role in the causation of papillary pathology and the etiology of stone. The close relationship that exists between the so-called calculus age and that of focal infections—twenty-five to fifty years—has never been pointed out, and while clinical studies are too uncertain to be trusted, it has been our constant observation that patients with primary renal calculi consistently have active focal infectious conditions elsewhere. One must not lose sight of the undoubted fact that toxins other than bacterial (diabetic, metabolic dehydration) may produce a similar renal response.

So the treatment and prevention of primary renal calculus embraces a broad study of the individual patient, an intelligent analysis and control of his urine and the correction of pertinent factors, most of which are quite distant from the seat of disease.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Kettel, K. Osteomyelitis of the Frontal Bone
Surgical Treatment Which Way of Approach
is the Best? *Arch Otolaryngol* 1940 31 622

Osteomyelitis of the frontal bone may be extraordinarily dangerous, because of the rapidity with which it spreads and the frequency with which it is followed by intracranial complications. The operation for this condition has two purposes: first, to remove all the diseased part of the bone and to drain possible deep seated inflammation (leptomeningitis, epidural abscess or possibly abscess of the brain), and, second, to clean out and drain the sinuses from which the infection has originated.

The bone affected by osteomyelitis behaves as though it contained a malignant tumor. The resection must therefore, be performed in healthy tissue. It may be difficult, and it is sometimes impossible, even during the operation, to decide with certainty where the bone is healthy. Before the operation it is impossible to do so.

Kettel finds that unrestricted access for resection of the frontal bone and the adjacent parts of the parietal bone, the frontal sinuses, the ethmoid labyrinth, the roof of the orbit, and the lamina cribrosa is obtained by a coronal incision above the hair line, which permits reflection of the scalp covering the forehead forward over the face. The cicatrix is concealed by the hair, and, as no branches of the facial nerve and no muscles have been cut, and as no tense scars are to be found on the forehead, the cosmetic and mimetic results are ideal.

NOAH D. FABRICANT, M.D.

Szeker, J. Facial Bone Fractures (Brüche der Gesichtsknochen) *Arch. chir. Klin. Univ. Ptes.* 1939, p. 219

The facial bones consist of the nasal bones, the vomer, the inferior turbinated bones, the lacrimal bone, the superior maxilla, the zygomatic bone, the palatum durum, and the inferior maxilla. Since injury to the lacrimal bone belongs in the sphere of the ophthalmologist, and injury to the maxilla in that of the dental surgeon, the author disregards these two.

Fractures of the nasal bones, representing independent bone fractures, occur after comparatively unimportant traumas (blows, boxing), a more violent traumatic influence is associated with injury to other facial bones as well. There are lateral and bilateral injuries, and they are usually internal, situated toward the nasal passages. Diagnosis is easy. A roentgenogram, preferably taken from two angles, will throw light on difficult cases. Treatment

is simple and consists of the reposition of the bone which may be displaced, or of the entire nose which may be displaced to one side; reposition is followed by adequate fixation with a Josef or Truchwald nose clamp or with a cast. The nasal passages must receive special attention, postoperative strictures accompanied by respiratory and olfactory disturbances are not easily corrected.

An isolated fracture of the vomer is rare. This, as well as a fracture of the inferior turbinated bones, is usually a manifestation accompanying fracture of the superior maxilla. Also the isolated fracture of the superior maxilla is an infrequent occurrence; it follows more violent injury and, as a rule, is complicated with fracture of the zygomatic bone. The three Le Fort fracture lines are considered the ones most frequently encountered but in addition to these typical ones there are fracture lines in other directions. The main symptoms are hemorrhage in the soft tissues and facial cavities, the hemorrhage may become so severe that ligation of the carotis externa may have to be considered. In cases of nerve injury it is principally the second trigeminal ramus which is involved, followed by a slight paresthesia or a complete anesthesia, a subsequent manifestation is neuralgia. Lock jaw, injury to the eye, and other disorders, including disturbances in salivation, paralysis of the palatum molle, and lesion of the inner cranium occur.

Regarding injuries to the superior maxilla, two groups may be distinguished: (1) bone fissures and minor bone displacements, which in regard to future function are of no importance, they require no special interference, and (2) major fractures.

Among the 20,000 recumbent patients in the Clinic, 3,000 suffered from bone fractures, among these were 116 skull injuries, of which 12 were fractures of the superior maxilla. Three of these cases required surgical interference. This implies the Luc Caldwell method, consisting of opening of the proper superior maxillary cavity, removal of the hemorrhagic extravasate, reposition of the displaced bones with tamponade, and suture. Special attention should be given an eventual injury to the nerves, or their exposure to pressure from the fractured bone ends and bone splinters.

In the treatment of fractured superior maxillary bones there are two possibilities which must be borne in mind: infection and plastic exudate. A fractured superior maxilla, generally caused by a violent injury, is often associated with a fracture of the zygomatic bone, and the fractured end is usually forced into the superior maxillary cavity. In such cases it is necessary to expose the sinus maxillaris.

Arious method are cited for the reposition of a fractured zygomatic bone (Mata, Garner, Gillies, Hoefel, Luc Caldwell). Particular care should be given the treatment of the teeth.

Summing up the author explains that in judging the extent of the facial bones the following rules should be considered: (1) treatment of the injured soft tissues alone is insufficient for proper healing; the elimination of the nose and its neighboring cavities is absolutely necessary; (2) in injuries of the secondary cavities, infection and plastic exudate require special consideration; and (3) once the advantages of exposing the sinus maxillaris are recognized, this method should be used in suitable cases.

(E. Itzfs) HEND H WILSON

EYE

Davis, F. A. Primary Tumors of the Optic Nerve (A Phenomenon of Recklinghausen Disease). Clinical and Pathological Study with Report of 5 Cases and Review of the Literature. *Arch Ophth* 1919, 3: 735-957.

In this very detailed, comprehensive and well illustrated treatise the author brings out some points that seem to require further research for confirmation or disproof. He states: "This paper is a clinical and pathologic report of tumors of the optic nerve associated with Recklinghausen disease based on a study of 5 cases and a review of the literature."

So-called primary tumors of the optic nerve usually appear as one of two types, namely gliomas and endotheliomas, the former being much the more common. Endotheliomas resemble those found in the brain, known as meningiomas or meningeal fibroblastomas. They arise from the dura or arachnoid sheath of the nerve or at times by extension from similar growths within the cranial cavity.

This study indicates that glial tumors start with abnormal proliferation of the normal adult types of neuroglia of the nerve stem. After varying periods of growth, the abnormal neoplastic neuroglial cells penetrate the pia, with the formation of gliomatous tumor of the sheath. Proliferation of the mesothelial cells of the arachnoid follows the glial penetration of the pia, with the formation of a tumor-like mass in this portion of the nerve sheath. Later intermingling of the proliferated cells from these two areas produces a complex histological structure the precise nature of which is difficult to interpret unless earlier stages of the growth have been studied.

Study of sections from these tumors reveals five different stages in the evolution of their growth.

Since these growths exhibit all the characteristics of true tumors, they should be designated as gliomas. Such terms as gliomatous and astrocytic should be used merely as descriptive terms for the earliest phase of their development. Complete histogenesis of the neoplastic cells has not been determined. Such terms as spongioblastoma, spongiopneuroblastoma, astrocytoma, and oligodendrocytoma have been reported.

The outstanding feature of the neoplastic cells was excessive fiber formation within as well as without the nerve stem. This, together with the general character of the cells as revealed by special staining indicates that predominant cell types are astrocytes, so that these tumors are designated astrocytomas.

The 5 cases here reported are all associated with the bovine type of Recklinghausen disease. Other lesions, such as pleomorphic neurofibromatosis of the orbit and globe, were present in one case while manifestation of involvement of the central nervous system, such as gliosis of the chiasm and other areas of the brain, and glioma of the temporal lobe of the brain were also encountered.

The review of the literature reveals at least 3 authentic cases of tumors of the optic nerve associated with Recklinghausen disease. Many other cases of the latter disease in which reduced vision and atrophy of the optic nerve were reported, probably fall within this classification. This association can no longer be considered as merely coincident.

The cause of Recklinghausen disease and related lesions is not known. Pathologists are in disagreement concerning the nature of the tumors which accompany the disease. The lesions which make up this syndrome are more widespread than at first believed. One group of pathologists maintains that tumors of the peripheral nerves arise from some defect in the sheath of Schwann cells, a neuro-ectodermal derivative while others assert that they arise from the fibrous elements of the nerves.

Studies of Del Rio Hortega, which are endorsed by Penfield, indicate that the oligodendroglia of the central nervous system, which includes the optic nerve is homologous with the Schwann cells of the peripheral nervous system. A similar function of these two cell elements, namely maintenance of the myelin sheath of the nerve, is therefore probable. A defect of these homologous structures has been suggested by Del Rio Hortega as a common source of origin of tumors of the optic nerve and tumors of the peripheral nerves.

Attempts to find some common background for all the tumors which make up the Recklinghausen syndrome as now known are complicated by the great dissimilarity in structure of some of the tumors. This suggests that the primary lesion in this complex disease must be sought in some degenerative change which primarily affects the nerve substance itself, while the tumors which follow may be secondary growths in the various supportive elements.

That tumors of the optic nerve probably belong to a system disease originally suggested by Emanuel, is borne out by the simultaneous appearance of multiple lesions in the central and peripheral nervous systems, but the fact that the tumors are bilateral at times, and further, by the fact that multiple involvement of the nerve has been reported. The slow rate of growth and the relatively benign nature of the tumors are characteristic of other lesions associated with this syndrome.

This study and review of the literature have led the author to conclude that tumors of the optic nerve are in many, if not most, instances but a part of a more widely disseminated lesion of the peripheral and central nervous systems, commonly referred to as neurofibromatosis, or Recklinghausen's disease.

The term "neurofibromatosis" or "neurofibroma" as applied to tumors of the optic nerve should be abandoned, for they are usually gliomas or endothe-liomas

LESLIE L. MCCOY M.D.

EAR

New, G. B., and Erich, J. B. Protruding Ears. A Method of Plastic Correction. *Am J Surg*, 1940, 48 385

Among the most engaging of purely plastic surgical problems is the correction of protruding deformities of the ears. By a process of trial and error the surgical technique has undergone a series of gradual steps toward perfection. There is yet opportunity for improvement. Few of us realize the amount of mental discomfort endured by some sensitive individuals who have abnormalities such as this. When this deformity is the fundamental basis for an obsession or an inferiority complex, correction of the abnormality promptly removes the mental or emotional symptoms. Then, too, it is a matter of common knowledge that even a few intelligent and well-educated people find it impossible to obtain certain types of positions because of this deformity.

An outstanding ear is the result of a congenital malformation of the anthelix. The embryological factors which produce this flattening or concavity of the anthelix are unknown. To make a broad statement, it might be said that the cephaloauricular angle is decreased in proportion to the increase of convexity of the anthelix. This generalization, as a matter of fact, forms the basis of treatment in the more recently devised operations for the correction of outstanding ears, the aim of these surgical procedures is to restore to the anthelix its normal convexity, which, in turn, mechanically deflects the ear inward toward the head.

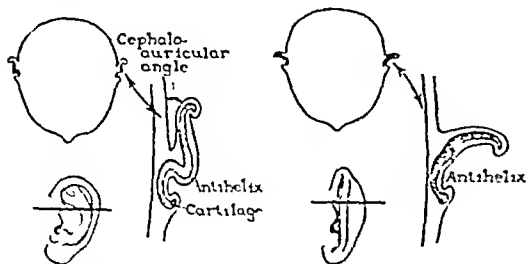


Fig 1

Fig 2

Fig 1. Cross section of a normal ear illustrating the marked convexity of the anthelix.

Fig 2. Cross section of an outstanding ear illustrating the flattened anthelix and the resultant protrusion of the scaphoid and helical portions of the auricle.

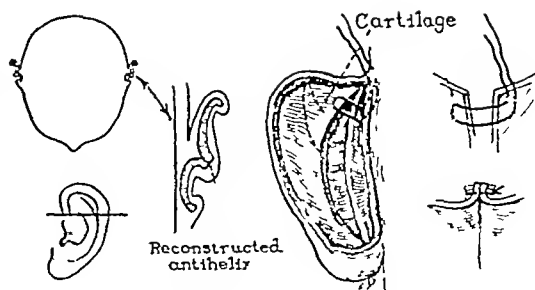


Fig 3

Fig 4

Fig 3. Cross section of a reconstructed protruding ear. After excising an elliptical strip of cartilage, correctly inserted mattress sutures evert the cut edges of the cartilage so as to produce a normally convex anthelix, which, in turn, rectifies the abnormal state of protrusion.

Fig 4. Diagram of the posterior surface of a protruding ear. The skin has been entirely removed to give a better view of the auricular cartilages. This drawing illustrates the elliptical strip of cartilage which has been removed, and the method of inserting mattress sutures from the anterior surface of the ear through skin and cartilage. On tying these sutures over small cotton rolls, the cut edges of the cartilage are everted to produce a convex anthelix. The dotted margins of the triangular area on the upper portion of the auricular cartilage indicate the site at which a secondary wedge of cartilage may be removed for the construction of a convex posterior crus, this procedure counteracts any tendency of the upper portion of the ear to lop forward. (Courtesy of Am J Surg.)

The deformity can be corrected satisfactorily at almost any age. A child with outstanding ears is best operated on when he is about five years old, before entering school, so as to preclude the possibility of his developing emotional disturbances as a result of the abnormality. Such operations at this early age apparently do not interfere with the subsequent normal growth of the ears. In the majority of cases of protruding ears, the technique as described will correct the deformity very satisfactorily.

Galloryboff, T. L. Plastic Reconstruction of the External Ear. *Nor khir arkh*, 1939, 45 148

Reconstruction of the external ear is most frequently indicated after traumas, burns, frost bites, and congenital malformations, less frequently the operation is performed after the excision of tumors. Corrections of partial defects of the external ear can be accomplished according to the numerous methods, but the greatest difficulties are encountered in cases in which a complete reconstruction of the ear is necessary. Gelatin prostheses, formation of pedunculated flaps from the skin of the neck, and transplantation of cartilage have been suggested, but the plastic methods have not yet been perfected.

The author reconstructed 7 ears in 6 patients by transplantation of rib cartilage. All of the patients were men, and the operations were performed under local anesthesia. In 4 instances the external ear was absent entirely and in 2 partially. The tubular flap was prepared from the chest or dorsal region. A

few months after the flap healed in, fragment of rib cartilage was implanted through an upper-posterior incision. The author drives exposure of costal arch close to the sternum. He removes the cartilage of the adjoining ribs in order to prepare the fragment with a satisfactory oval outline. Several minor operations may be required to improve the cosmetic results.

JOSEPH K. NARAY, M.D.

NOSE AND SINUSES

Van Dishoeck, H. A. E. Nasal Plethysmometry As New Test for Sinus Thrombosis. *Arch. Otolaryngol.*, 94, 3 383

A new test for sinus thrombosis is described by the author. The technique is based on the fact that compression of the healthy jugular vein while the other jugular vein is obstructed, in most cases, causes congestion of the wide venous spaces of the nasal turbinates. The swelling of the concha can be seen in some cases by anterior rhinoscopic examination, but it can be clearly demonstrated in every case by means of simple apparatus, the nasal plethysmometer.

This apparatus consists of two small inflatable rubber balloons, each of which is mounted on one leg of a small manometer. When one of these balloons or both are introduced into the nose one can blow them up without displacing the meniscuses by means of the bridge, while the clip is placed on the rubber connection. When the bridge is closed with

the clip on the rubber connection, every variation in conchal swelling will result in a displacement of the manometer fluid.

The instrument can be used in two ways: is one the balloon is introduced into the nose on the side where the jugular vein will be compressed first and then on the other side; in the other one balloon is introduced into each nostril. In a normal patient slight pressure on the left jugular vein will cause slight swelling of the left concha and no swelling, or very little, of the right one. Pressure on both jugular veins causes considerable swelling in both nasal passages. On anterior rhinoscopic inspection, especially the detourance when the pressure on the veins is released is clearly seen.

In a case of sinus thrombosis on the left, pressure on the left side of the neck does not produce swelling, while pressure on the right side causes considerable swelling of the right turbinate and a little swelling of the left turbinate. The positive symptom is thus the marked difference in the conchal swelling when pressure is applied on the healthy side from that when it is applied on the obstructed jugular vein. A preliminary nasal examination is necessary because the experimental result may be invalidated by the following circumstances: (1) the presence of too little cavernous tissue on account of nasal crests, operations or atrophy; (2) previous swelling of the nose; (3) its utmost capacity; and (4) obstruction of the venous connections of the nose and the endocranial system, i.e. in thrombosis of the cavernous sinuses. A definite positive result is diagnostically valuable. Only with congenital aplasia of the sinuses is confusion with thrombosis possible.

NOAM D. FARMACUT, M.D.

Pfahler, G. E., and Vantine, J. H., Jr. The Roentgen Diagnosis of Cancer of the Accessory Sinuses. *Arch. Otolaryngol.*, 94, 3 36

To think of the possibility of cancer of the accessory sinuses is the first essential in making the diagnosis. One or many of the following signs and symptoms should suggest cancer of the nasal and paranasal cavities: (1) a sense of fullness in the nose—partial or complete nasal obstruction, usually unilateral; (2) nasal discharge—either mucopurulent or seromucinous; (3) pain—headache if the superior anatomical section is involved, and neuralgia if the alveolus or the floor of the antrum is involved or if the fifth nerve or its branches are involved; (4) fetid odors, if necrosis or ulceration is present; (5) change of the nasal tones of the voice due to nasal obstruction or blocking of the antrum; (6) loss or alteration of the sense of smell; (7) in late stages, expansion or destruction of bone due to pressure atrophy or invasion by the tumor with swelling of the face, swelling of the alveolus, and loos of the teeth; (8) invasion of the orbit producing such signs as exophthalmos and proptosis; (9) ulceration of the tumor in situ, giving rise to hemorrhage; (10) invasion of the skin with edema and later ulceration; (11) local extension to the base of the skull, with consequent neurological

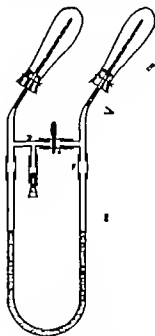


Fig. 1. Nasal plethysmometer.

In 1936 iodized salt was sold in place of ordinary salt by order of the government. Iodized salt was sold only upon special request. In 1938 examination of the school children was repeated, and since the statistics again referred to 3,000 individual examinations, they appear decisive for the entire population. They show unquestionably a considerable reduction in the occurrence of struma since the introduction of iodized salt.

However struma cannot be entirely eradicated by the use of iodized salt since iodine deficiency represents only about 75 per cent of the causative factors of goiter. Other causes, particularly social influences, play a certain rôle. Unfortunately also, the order of the authorities is not strictly carried out as several merchants arbitrarily continue to sell uniodized salt.

In addition, ever since the distribution of iodine tablets in the schools of the city of Bern was discontinued in the expectation that an iodized salt prophylactic could suffice new cases of enlarged thyroids have been observed. On the whole however the number of goiter cases has diminished. Boys usually showed better results than girls as the iodine requirement is greater in the female.

(A. BECHTOLD) HUNZILER WOLFF.

Cohn, L. C. and Stewart, G. A. Tumors of the Lateral Thyroid Component. *Arch Surg* 94, 40-45.

Up to this report 156 cases of tumor of the lateral thyroid component have been recorded in the literature. The authors did 7 new cases from the Surgical Pathological Laboratory of the Johns Hopkins Hospital. Previously 3 cases had been reported from this laboratory; these 3 cases are also reviewed here. In the majority of cases the clinical diagnosis was incorrect.

Aberrant thyroid tissue deposited during migration of the median primordium has been reported as occurring in various locations in the midline of the neck, from the foramen cecum of the tongue to the definitive thyroid gland. Also, thyroid tissue has been reported as occurring in the nasopharynx, larynx, trachea, esophagus, mediastinum, pleura, pericardium ovary and long bones. The present study is limited to consideration of tumors of thyroid tissue located in the lateral regions of the neck, with and without tumors in the thyroid gland resembling them histologically.

The tumors have been divided into three groups: (1) adenocarcinoma of the thyroid gland with metastases to the cervical lymph nodes (7 cases); (2) aberrant malignant thyroid tumor in the presence of normal thyroid gland (9 cases) and (3) benign aberrant thyroid tumors (4 cases).

I Group there are 6 cases of palpable tumor of the thyroid gland at the time of examination and in 5 instances the tumor was typical adenocarcinoma. The other tumor was classified as variant of the papillary adenocarcinoma (marked vascular invasion). The absence of remote metastases many years after involvement of the regional lymph

nodes in 5 cases confirms the low grade of malignancy of the majority of these tumors. However local recurrences were the rule. Distant metastases occurred in 1 case. Two of the patients had slight toxic symptoms. A seventh patient had a tumor of the thyroid gland with local metastases eighteen years after thyroidectomy.

Group II consisted of 9 cases of aberrant malignant thyroid tissue in the presence of a normal thyroid gland. There was 1 case with no metastases to the cervical lymph nodes, 3 cases with metastases to the cervical lymph nodes, and 5 cases in which there were metastases to the cervical lymph nodes with no known thyroid or aberrant tumor in the history or on examination, it having been removed previously and not diagnosed, or so involved in the mass of carcinomatous lymph nodes as to be undemonstrable.

In discussing the papillary tumors as well, Groups I and II it was found that the average age of the patient when the tumor was first noted was thirty-five years. There were 1 female and 5 males. There were slight toxic symptoms in only 1 instance. In 7 cases the primary tumor was in the thyroid gland and in 9 cases the primary tumor was in the lateral aberrant thyroid tissue. In 5 cases the location of the primary aberrant thyroid carcinoma was definitely known, in 3 cases it was in the submandibular region, in 1 case it was in the region of the hyoid bone, and in 1 another case in the suprasternal area.

The frequency of recurrence demonstrated the necessity of adequate and extensive resection. In spite of the high incidence of recurrence, death from remote metastases occurred in only 3 patients (33 per cent) and in both there was vascular invasion.

I Group 3 (benign aberrant thyroid tumors) there was 1 patient with palpable tumor of the thyroid, with tumor of the thyroid previously removed, and 1 with no palpable tumor of the thyroid, nor had such tumor been removed. Aberrant thyroid tissue can undergo hypertrophy or even compensatory hyperplasia because of hypofunctioning thyroid gland or because of neoplasia. Histologically it is difficult to differentiate between hyperplasia and neoplasia.

Because of local or regional recurrence after operation in 7 per cent of the papillary tumors in this series the authors urge complete excision and block dissection of the cervical lymph nodes in cases of papillary tumors.

EARL O. LATIMER, M.D.

Ward, R. The Relation of Tumors of Lateral Aberrant Thyroid Tissue to Malignant Disease of the Thyroid Gland. *Arch. Surg.* 94, 46-50.

The author presents 5 cases of tumors of aberrant thyroid tissue of which he considers malignant and 3 benign. Each case is discussed giving his reasons for classifying the growth as benign or malignant. He states that only the passage of time and eventual outcome will prove whether the tumors are malignant. Since 4 tumors of aberrant thyroid tissue are of such low grade of malignancy and many malignant tumors of thyroid tissue in general

have a tendency to be dormant or to progress very slowly over many years, a long period of observation in addition to a rigid follow-up in all cases is necessary before conclusions can be drawn

In 4,274 operations from which material was available for study there were 15 tumors of lateral aberrant thyroid tissue and 95 malignant growths arising in normally situated thyroid glands. The average age of the patients with malignant tumors of a lateral aberrant thyroid was twenty-four years, while the average age of the 95 patients with malignant tumors in the normally placed thyroid was fifty-two and seven-tenths years. Fifty-eight per cent of the patients with malignant tumors arising in lateral aberrant thyroids were under thirty years of age while only 7 per cent of the malignant tumors of the midline appeared in the first three decades of life.

The mortality for the malignant tumors of lateral aberrant thyroid origin as compared to that for the tumors arising in the midline gives a ratio of 25 to 53.3.

The ratio of males to females is 1:1.4 for malignancy of the lateral aberrant thyroid as compared to 1:3 for the midline malignant tumors. The most common location of the tumors is along the course of the sternocleidomastoid muscle. Other locations were in the inferior carotid and subclavian triangles.

EARL O. LATIMER, M.D.

Schugt, H. P. The Piriform Sinus: Anatomical and Clinical Observations, with a Review of the Literature. *Arch. Otolaryngol.*, 1940, 31: 626.

Since the superior laryngeal nerve runs through the piriform sinus and its course is superficial it is possible to produce anesthesia of the nerve by applying a local anesthetic directly to the mucosa of the piriform sinus. This procedure is used by some laryngologists before operations on the larynx. In some cases of painful deglutition due to tuberculosis it is possible to block the nerve by the superficial injection of not more than 0.5 cc. of alcohol.

Acute inflammations localized in the piriform sinus are rare. In such cases the patients complain of severe pain on the affected side. On examination the rest of the pharynx, the nasopharynx, and even the larynx appear normal. Congenital cysts, the lining of which can also be seen in the piriform sinus, are likewise rare. However, since the piriform sinus forms a part of the posterior surface of the thyroid cartilage, it is possible for an abscess to form in the larynx from an isolated infection of the lymph tissue in the sinus if the inflammation has penetrated the interior of the larynx by way of the loose submucous tissue. In addition, the piriform sinus is the most dependent part of the hypopharynx and acts in a way as a receptacle for inflammations which may spread from the higher lying organs, such as the pharynx and the tonsils.

The anatomy of this region explains why inflammations in the piriform sinus do not always remain localized. Posteriorly and laterally the piriform si-

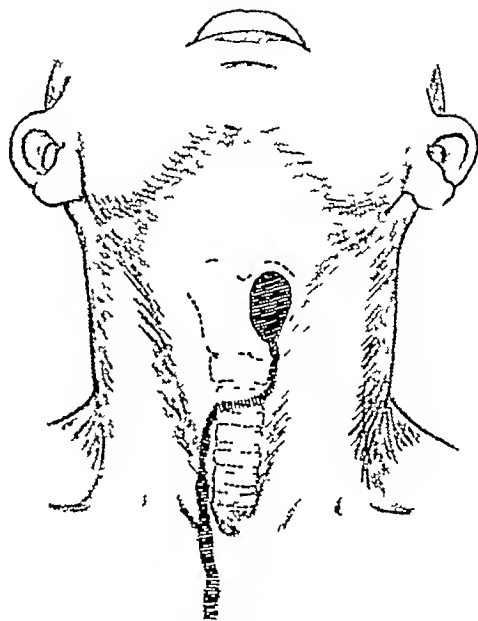


Fig. 1. An abscess in the larynx behind the left thyroid plate and in the piriform fossa has broken through the cricothyroid membrane and burrowed downward behind the trachea into the right side of the mediastinum.

nus is in contact with the posterior surface of the pharynx. This in turn is bound to the prevertebral fascia by loose, movable connective tissue, rich in lymphatics. Thus there is a direct path for inflammation to spread to the mediastinum. The various ways in which abscesses of the posterior surface of the thyroid cartilage, particularly those of the piriform sinus, can invade the neighboring tissues of the neck and the mediastinum are:

1. Pus can spread from the piriform sinus along the posterior surface of the thyroid cartilage and, breaking through the cricothyroid ligament, reach laterally into the deep tissues of the neck. From here the pus can then follow the great vessels into the mediastinum.

2. Another path exists from the piriform sinus around the posterior edges of the thyroid cartilage into the region of the great vessels.

3. The abscess in the piriform sinus can break through the thyroid cartilage anteriorly without being definitely palpable or visible. This is due to its deep position behind the sternohyoid and sternothyroid muscles. In such cases the abscess may burrow downward and be imperceptible until later, after it has descended into the mediastinum. It may then appear as a painful swelling in the second intercostal space next to the sternum.

4. The fourth path leads from the piriform sinus into the neighboring prevertebral space, from which a direct path leads to the posterior mediastinum.

Foreign bodies are easily impacted in the piriform sinus. Pointed foreign bodies such as needles and fish bones, may be buried beneath the soft mucous membrane through the act of swallowing and at times are therefore invisible on examination. In the author's experience, as well as that of others, frothing in the piriform sinus is noted in the following diseases, in all of which there is more or less disturbance in swallowing: esophageal diverticulum, aortic aneurysm, substernal thyroid, tumor of the esophagus, esophageal varices, and bulbar paralysis.

Finally, the following findings in an examination of the piriform sinus for possible malignant infiltrations should be considered: (1) deviation of the larynx to one side; (2) enlargement of the diseased piriform sinus; (3) shallowness of the piriform sinus through bulging of its floor; (4) hardening of the thyrohyoid membrane; and (5) the presence of small glands on and to the side of the thyrohyoid membrane.

W. H. D. FARRINGTON, M.D.

Frank, I. and Lev, M. Carcinosarcoma of the Larynx. *Ann Otol Rhinol & Laryngol* 940, 49.

Since the time of Virchow various tumors have been described as carcinosarcomas or malignant tumors of dual origin. Recently, Saphir and Vass and Saphir have reviewed the literature of these tumors. From this study and from the study of series of their own cases, they have grave doubt as to the existence of such tumors. Rather they strongly suggest that in most cases of diagnosed carcinosarcoma, the tumors are actually carcinomas which had undergone morphological variations.

In order to study further the validity of this interpretation, the authors undertook to study a large series of carcinomas of the same organ in order to see how frequently morphological variations approaching the sarcomatous arrangement of cells occurred. If carcinomas and how many so-called carcinosarcomas they could find in any one organ. The organ chosen for initial study was the larynx because of the frequency of origin of atypical carcinomas from the respiratory tract. Histological sections from 61 squamous and transitional cell carcinomas of the larynx were studied with the objective of analyzing the sarcomatous features in these tumors. It was found that almost half of the squamous and more than half of the transitional cell carcinomas showed this tendency to a variable degree. When it was found to be most marked, the tumors resembled what has been called carcinosarcoma.

Five cases of carcinosarcoma of the larynx found in the literature were reviewed, analyzed, and compared with the authors' proven carcinomas. They were found to be almost identical with their tumors, and, therefore, they are not carcinosarcomas but carcinomas which have undergone morphological variations.

The factors responsible for the sarcoma-like arrangement of cells are (1) an inherent tendency of the tumor itself, and (2) the amount of connective tissue environment of the tumor.

The question of the clinical significance of the 'sarcomatous' features in these carcinomas is not definitely answered in the present study.

JOSEPH E. NARA, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS, CRANIAL NERVES

Bréhant, J Traumatic Diabetes Insipidus (Diabète insipide traumatique) *J de chir*, 1940, 55 205

The paucity of published reports concerning traumatic diabetes insipidus can hardly be taken as an index to the incidence of the disease, for, according to Bréhant, traumatic diabetes insipidus certainly cannot be regarded as rare or unusual, even though it is not of frequent occurrence. This is true especially in the present automobile age. To illustrate the syndrome, the author gives in full the history of a woman of forty-one years, who received a severe injury about the head with basilar frontal fractures, and who from the first day suffered a marked increase in thirst and urinary output. Blood chemistry studies, urinalyses, and neurological examination gave normal findings save for a specific gravity of the urine equal to that of water. The output was from 10 to 14 liters a day, and the only agent which effected any control over the condition was nasal insufflation, 4 or 6 times daily, of powdered posterior pituitary lobe.

As to the cause of diabetes insipidus, the author points out that it may arise as the result of localized tumor in the floor of the third ventricle, syphilis, encephalitis, and other less specific factors. The traumatic type may be due (1) to tissue injury of the infundibular area as a result of fracture (clots within the third ventricle are believed to settle out on the floor of the ventricle and on the infundibulum), (2) to compression of the floor of the third ventricle resulting from a subarachnoid hemorrhage, and (3) to sudden changes in the mechanics of the cerebrospinal fluid. Other causes may be hypophyseal and infundibular pressure from a callus, a localized osteitis, a localized pachymeningitis, or a localized hypothalamic gliosis. The polyuria is believed to be the essential and primary symptom, it appears before the polydipsia, but although the polyuria is brought on through central control, these two symptoms appear to be dependent upon one another. The onset of the polyuria may occur immediately, within the first twenty-four hours after the accident, or it may occur as late as five weeks post-traumatically (Leriche and Fontaine). One can visualize certain of the afore-named pathological processes developing in this time interval, so that a delayed traumatic diabetes insipidus seems to be entirely possible. Other possible secondary or associated disturbances are (1) changes in the carbohydrate and fat metabolism, (2) changes in the sexual sphere, and (3) morphological changes such as nanism, acromegaly, and excessive emaciation. Disorders of sleep may accompany the condition.

Treatment is limited, but traumatic diabetes insipidus should not be looked upon as a disease

existing beyond the pale of all hope. The surgical removal of a localized, extracerebral, subarachnoid clot, repeated lumbar punctures, a salt-free regimen, and the intranasal administration of posterior pituitary-lobe powder have all been used successfully by many different investigators, and such measures should be given a fair trial when indicated. Occasionally traumatic diabetes insipidus is of only temporary existence, most commonly, however, it is permanent.

JOHN MARTIN, M D

SPINAL CORD AND ITS COVERINGS

Aynesworth, K H The Cervicobrachial Syndrome
Ann Surg, 1940, 111 724

The present study is based on 20 cases. Aynesworth is not satisfied with the designation "scalenus syndrome" for the syndromes produced by the scalenus anticus and cervical ribs. He prefers the term "cervicobrachial syndrome" as he believes that this term gives a comprehensive and anatomical concept which is accurate and inclusive. He divides his cases into those exhibiting neurological symptoms as their major manifestation, those which exhibit vascular symptoms, and those exhibiting a combination of both. He lists the following as the theories on the etiology of the cervicobrachial syndrome: (1) Compression of the nerve trunks as they pass between the scalenus anterior and scalenus medius. (2) Injury to the nerve trunks and the subclavian artery as they cross the normal rib or a cervical rib, or when they are obstructed between the clavicle and the normal or cervical rib. (3) Injuries to the sympathetic and vasomotor nerves supplying the subclavian artery by the scalenus anterior or cervical rib, producing vascular damage. (4) Traumatism, direct or indirect, of the scalenus-anterior muscle resulting in fibrosis and contraction, which compress the nerve trunks and the subclavian artery. (5) Embryological defects which alter the course of the nerve trunks in relation to the scalene muscles and normal cervical ribs. (6) Postural or functional defects, such as dropping of the shoulder girdle, posture due to ill health, faulty postural habits, occupational or vocational habits, advanced age. (7) Narrowing of the upper thoracic cage as a result of adjacent infections or anatomical defects. (8) Acute infections producing myositis. (9) Intermittent traumatism to the subclavian artery by a cervical or normal rib, due to normal movements of the shoulder joint.

In 80 per cent of the author's cases trauma was an etiologic factor.

In the discussion Gage states that in 1934 he presented two prevailing theories: (1) Todd's failure of the descent of the shoulder girdle, and (2) Jones' low origin of the brachial plexus. To these two he added "spasm of the scalenus muscle" which he be-

lives to be responsible for the persistence of the syndrome. He is able to confirm the spasm of the muscle as the cause for the persistence of the symptoms by blocking the scalenus-anticus muscle with 1 per cent novocain. This resulted in the relief of the symptom for varying periods of time up to ten hours. In a anatomical study he found that there are scalenus nticus major and minor in a number of subjects, the brachial plexus and subclavian artery passing between them in all cases in which they existed. That this condition has been found in 8 of 27 cadavers. In 2 instances the brachial plexus was found to pass through the fibers of the scalenus-anticus muscle. These findings may have bearing on the etiology of the scalenus-anticus syndrome. D. von J. LEONARDO M.D.

Pennybacker, J. Sciatica and the Intervertebral Disc. *Lancet* 1940, 33, 77

The syndrome of the intervertebral disc may be due either to herniation of the annulus fibrosus on the posterior surface of the intervertebral disc, or to an actual rupture and extrusion of the nucleus pulposus. Usually a history of definite back injury followed by persistent low back pain is obtainable. In an eventual sciatica and paresthesia in the area of sciatic distribution. There may be tenderness over the course of the sciatic nerve, slight muscular weakness in the foot and calf and diminished or absent knee jerk. If the herniation is large one there may be some increase in the protein content of the cerebrospinal fluid, though this finding is no more necessarily constant than is a partial manometric block. Lipoidal studies are usually concisive and the herniated disc may be removed through small, essentially unilateral laminectomy.

A common problem is the differentiation of intervertebral disc damage from low back pain, and sciatica due to various orthopedic causes, such as sacro-iliac strain, sacro-iliac arthritis, spinal osteoarthritis, scoliosis and other structural changes. Low back pain and sciatica are common sequelae of various pelvic and gynecological disorders, and there is the occasional perplexing, chronic, sciatic pain which though not disabling, is persistent and annoying, and of which discovery of the causative factor is difficult. JOHN MARTIN, M.D.

Hyndman, O. R., and Jarvis, F. J. Gastric Crises of Thoracic Dorsalis Treatment by Anterior Chordotomy in 8 Cases. *Arch Surg* 1940, 40, 997

In their experience with 8 cases of gastric crises of tabes treated by chordotomy the authors feel gratified with their results and urge the operation as a means of relief from this peculiar type of pain. The chordotomy must be bilateral and done at no lower a level than the third thoracic segment of the cord, the cutaneous loss of sensibility to pain being brought to the nipple line. They believe that the spinothalamic tracts be farther anterior and in the cord than is generally appreciated. An incision 3 mm.

deep, beginning 1 mm. anterior to the dentate ligament and carried 3 mm. medial to the anterior root, will section the tract completely in the posterior thoracic cord.

Disadvantages of bilateral chordotomy are loss of cutaneous sensibility to pain and temperature post-operative urinary retention, occasional motor paralysis which are usually transitory and loss of sexual potency. The beneficial results, including relief from both the pain and vomiting, always overshadow such minimal disadvantages.

JOHN MARTIN, M.D.

PERIPHERAL NERVES

Potter, A. A Contribution to the Technique of Laterolateral Anastomosis of the Peripheral Nerves (Contributo alla tecnica dell'anastomosi latero laterale del nervi periferici) *Arch Ital Chir* 1939, 57, 453.

Potter completes his report on laterolateral anastomosis of the tibial nerve with the previously mentioned peroneal nerve in young dogs, in which varying amounts of fibers of the tibial nerve were resected at the anastomotic site, while only the epineurial and perineurial sheaths of the peroneal nerve were removed. The involved nerves were examined at varying intervals. The following observations were made:

Simple incision of the epineurium and perineurium of the tibial nerve for a length of 5 mm. with resection of about one-twentieth of its fibers does not allow the muscles innervated by the peroneal nerve to recover their function or trophism even after eight months. Histological examination of the nerve shows that the regenerated fibers do not exceed one-tenth of those previously present.

Removal of the epineurium and the perineurium and of one twentieth of the fibers of the tibial nerve for length of 5 mm. associated with longitudinal incision 1 mm. deep in the nerve sheath and parallel to its fibers, does not allow functional or trophic recovery of the muscles innervated by the peroneal nerve even after eight months. Histological examination of the nerve shows that the regenerated fibers are more numerous and amount to about one-eighth of those previously present.

3. Resection of one-fifteenth of the fibers of the tibial nerve shows after eight months partial recovery of the function and trophism of the muscles innervated by the peroneal nerve. This nerve presents after two, five and eight months a number of regenerated fibers equal to one-fourth, one-sixteenth, and one-sixth, respectively of those found in control.

4. Resection of one-eighth of the fibers of the tibial nerve is sufficient to allow nearly complete functional and trophic recovery of the muscles innervated by the peroneal nerve after eight months. This nerve presents an innervation 5 times lower than normal after two months and 4 times lower after eight months.

5 Resection of one fifth of the fibers of the tibial nerve shows complete functional and anatomical recovery of the muscles innervated by the peroneal nerve after eight months, this nerve presents after two and eight months, one twentieth and one half, respectively, of the number of pre existing fibers.

6 Resection of one fifth of the fibers of the tibial nerve causes only partial and temporary signs of hypokinesia in the muscles innervated by this nerve after eight months, these signs have disappeared and the histological sections are normal.

The histological study of the two nerves reveals that

1 The changes in the sheaths of the tibial nerve above and below the anastomosis are only temporary and have disappeared within a few months.

2 The re-establishment of the nervous connections of the peroneal nerve does not change, at least within eight months, the anatomical condition (such as hypertrophy, sclerosis, and lipomatosis) of its epineurial and perineurial sheaths, which continue to appear somewhat like those of a partially regenerated nerve, even if regeneration of the fibers is subtotal.

3 The coarseness of the systematization of the fibers in the anastomotic tract is proportionate to the number of bundles of fibers removed from the tibial nerve at its point of contact with the peroneal nerve.

4 It has been impossible to find in any histological section of the anastomotic tract deviations or real dislocations of the bundles of fibers, or of individual fibers, at any period or degree of the regenerative process, in fact, these fibers have not shown any signs of arrested or even difficult progression, such as terminal swelling or angulation.

RICHARD KEMPE, M.D.

Jeriché R. The Reasons for Failure in Suture of the Peripheral Nerves (Des causes d'échec des suture nerveuses) *Presse méd., Par.*, 1940 48 145.

Although suture of the peripheral nerves is generally regarded as a procedure which will lead to good results, this author believes that a large percentage of cases result in failure and are not reported. Even in the statistics of one individual, the results obtained for the suture of any particular nerve are extremely variable, ranging from a recovery rate of 15 per cent to one of 90 per cent for the radial nerve. The author is also of the opinion that there is a good deal too much attention drawn to the successful suture.

He discusses the many factors which tend to lead to a satisfactory suture, including the vascular role, which is not generally understood. He is of the opinion that when a nerve is injured, for instance by violence such as a bullet wound, although the obvious lesion in the nerve is excised and the nerve repaired, there is still damage in the nerve itself



Fig. 1. Decalcification of the lower extremity of the radius, of the ulna, of the carpus, of the metacarpus, and of the first phalanges three months after section of the median nerve at the entrance of the carpal canal. The nerve was sutured immediately. It is to be noted that the rarefaction exists even above the level of the section.

extending upward and downward for a distance from the site of the sympathetic lesion. Thus the suture of such a nerve is doomed to complete or partial failure.

Contrary to the opinion generally held in this country, he believes that the loss of more than 2 or 3 cm. of nerve substance will cause a poor result because of tension and traction on the nerve. This traction causes vascular changes in the nerve above and below the suture line, which prevent good healing. He reports 2 personal cases of primary nerve suture in a clear field in which the wounds healed by first intention, but the results obtained were not satisfactory.

Jeriché believes that there is still occasion for treating large defects in the nerves by graft. He is impressed by the rôle of the sympathetic nervous system and its effect on the vascularity of the parts. He believes that the need of keeping up the vascularity of the parts in cases of peripheral nerve lesion by repeated procedures directed at the sympathetic system has been neglected.

The roentgenogram (Fig. 1) shows rarefaction in the bones of the hand and in the distal part of the radius and ulna in a lesion of the median nerve as it passed under the transverse carpal ligament. The nerve was treated by immediate suture. The picture was taken three months after the injury.

ADRIAN VERBECCHI, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Dahl-Iversen, E. Cystic Disease; Its Pathogenesis, Prognosis, and Treatment (La maladie kystique, sa pathogénie son pronostic et son traitement) *J. internat. de chir.* 440, 5-85

Dahl-Iversen reports 250 cases of cystic disease of the breast. This condition is characterized by the formation of numerous cysts of varying size in one or both breasts. The breast may not appear enlarged, but on palpation it is found to be nodular and of harder consistency than normal. The breast is often painful and the pain increases characteristically just before or during the menstrual period. A clear serous or sometimes turbid fluid may escape from the nipple under pressure or spontaneously in some cases. This fluid may be bloody in the absence of cancer. Microscopic examination of a cystic breast shows proliferation of the connective tissue and epithelium of varying degree, deformation of the bile ducts and acini and the formation of cysts, many of which are lined with a pale epithelium. The cells of this epithelium are larger than normal and have fine granulated eosinophilic protoplasm. In some cases only a portion of one or both breasts is involved, the remaining tissue being entirely normal.

Both animal experiments and clinical experience indicate that cystic disease of the breast is due to ovarian dysfunction and interference with the normal balance of the ovarian secretions, but the exact nature of this dysfunction has not been definitely determined. Clinically cystic disease of the breast develops either in the first years after puberty or more commonly in older women preceding the menopause. The author has found that the administration of corpus luteum does not relieve but rather intensifies the symptoms, but the administration of folliculin has a favorable effect in a considerable percentage of cases.

The fact that cystic disease is sometimes found in association with carcinoma of the breast has led some investigators to conclude that malignant degeneration of the cystic tissues may occur with considerable frequency. The author's own experience and review of the more recent literature has convinced him that this conclusion is erroneous. In his series of 250 cases of cystic disease which have been followed up for the last five years no sign of cancer of the breast has been found.

Of these 250 cases, 75, or approximately two-thirds, have been treated with folliculin. The usual dosage has been .000 I U given by mouth three times a day for three or four months, usually four. Immediately after this treatment 83 per cent of the cases showed marked improvement both objectively and subjectively. In the majority of this group the breasts are entirely normal in consistency on palpation. 3 per cent showed less marked

improvement and 4 per cent no improvement. More than two-thirds of the cases treated with folliculin were re-examined more than three months after treatment as completed, on an average, 1 year after treatment. About half of the patients showed definite improvement had a recurrence of pain and infiltration of the breast. In most instances the recurrence had been noted a little more than three months after treatment, no recurrence was noted more than nine months after treatment. Another course of treatment with folliculin was less effective and the improvement as of shorter duration than after the first course. Approximately one-third of the patients treated with folliculin were free from symptoms from one to four years after treatment as completed. Others showed partial relief with little or no pain except for a few days before the menstrual periods. In some cases this pain was controlled by taking from 1 to 3 tablets of folliculin daily (.000 I U each) during the week preceding menstruation.

In cases in which operation was necessary, resection of the involved tissue was done if the lesion was localized. In other cases the breast was removed with conservation of the skin and nipple. The removed tissue should always be examined microscopically and if any evidence of beginning malignancy is found, radical operation should be done as soon as possible.

LUCIE M. MITCHELL

Grainger W: The Hormonal Etiology of Breast Cancer. *Am. J. Cancer* 940, 33-403.

The experimental production of mammary cancer by estrogenic hormones is one of the landmarks in the investigation of cancer. The importance of this discovery lies in the fact that the carcinogenic agent in this instance is a substance normally produced in the body and performing definite physiological functions in fact, a hormone. This adds to our knowledge of the etiology of cancer a new conception, namely, that for at least one organ, the breast, all the etiological factors concerned in carcinogenesis may be normally present in the organism.

Even if the estrogens have a direct carcinogenic effect, it does not manifest itself until they have produced their physiological effect on the breast. This physiological effect is like other hormonal effects, subject to control. We have thus, perhaps for the first time, the hopeful indication that prophylaxis of mammary cancer by medical treatment is a reasonable possibility.

The most obvious possibility is that mammary cancer appears as a result of a hypersecretion of this hormone. However, observations on high-cancer strains failed to give any evidence of this. We must assume, therefore, that the carcinogenic effect of estrogens is limited by factors inherent in the animal. We call these factors "susceptibility." For the

etiology of spontaneous skin cancer, the presence of the carcinogenic agent (a substance foreign to the physiological economy of the organism) is of decisive importance. For the etiology of spontaneous mammary cancer, in which the carcinogenic agent is a hormone normally formed by the body and always present, the factor of susceptibility is of greatest etiological importance. There are certain organs for which the cancer incidence is governed largely by an inherited constitutional factor. The outstanding organs in this group are the breast and the uterus in women, and probably the prostate in man. There is another group of organs in which the incidence is governed either by the occupation or by social conditions, so that we have what may be called "social cancer." These organs are those exposed to the influences and stimuli coming from without, they include the skin, and the digestive tract, from the lips to the stomach, inclusive.

With regard to the breast, the experiments carried out by Horning and the author give some evidence that susceptibility is dependent on the functional activity of the endocrine system, that is, upon a factor outside the breast. It was found that the action of estrogenic hormones is not limited to the female sex organs, but extends to the whole endocrine system, the organs most prominently affected being the pituitary body and the adrenal glands. The changes affect almost exclusively the anterior part of the pituitary body.

It was found that following adrenalectomy the general physiological effects of estrogens, such as arrest of growth, emaciation, and testicular atrophy, are diminished. Development of the breast in response to estrogens was also impaired, and carcinogenesis was either delayed or prevented. The physiological effects of the ovarian estrogen are conditioned by at least two other hormones, one from the anterior pituitary lobe, which antagonizes the estrogen, and one from the adrenal cortex, which enhances the action of the estrogen. The adrenal medulla contains probably a third conditioning factor, which, like the thyrotropic hormone, inhibits the action of estrogens. This relationship extends to the physiological action on the mammary gland, which responds to the estrogen by epithelial proliferation, less vigorously if the animal has been either completely adrenalectomized or thyrotropinized, and also, within limits, to the development of cancer in the breast.

The author draws the following conclusions concerning the susceptibility to mammary cancer:

- 1 It is not a fixed and unalterable quality residing within the organism, but can be modified.
- 2 It does not reside entirely, if at all, within the breast.
- 3 It is conditioned partly by a disturbance of the endocrine balance.

From the point of view of human cancerology, the conception of an endocrine imbalance as an etiological factor in cancer of the breast, and probably also of the uterus, should serve as a useful guide for

clinical investigations. There is now a possibility of treating precancerous conditions of these two organs by appropriate hormones. JOSEPH K. NARAT, M.D.

ESOPHAGUS AND MEDIASTINUM

Gerlings, P. G. Disorders of the Mouth of the Esophagus in the Syndrome of Plummer and Vinson (Dysphagia with Anemia). *J Laryngol & Otol*, 1940, 55, 143.

Dysphagia associated with a hypochromic anemia (the so-called Plummer-Vinson syndrome) usually occurs in middle aged women. Dysphagia usually has been present for years, and necessitates nourishment with liquids or soft foods. The discomfort resulting from the dysphagia is usually localized at the level of the larynx. On examination one usually finds a small mouth with fissures in both corners. Teeth are usually absent and the buccal mucous membrane is pale. The tongue appears glossy and the papillae atrophic. Leucoplakia may be present. The pharyngeal reflexes may be diminished. Koilonychia (spoon nails) are often seen.

The blood picture is that of hypochromic anemia and shows no other abnormalities. Achlorhydria is frequently found, and the anemia responds surprisingly well to the administration of iron, and, if necessary, hydrochloric acid.

On roentgenographic examination stagnation in the valleculæ, glosso epiglotticæ and in the sinus piriformis is often seen. The cause of this stagnation is thought to be due either to a partial swallowing paralysis or else to a reduced sensitiveness of the mucosa of the hypopharynx. Roentgenographic examination may reveal also a stagnation just above the mouth of the esophagus, or there may be a spastic stricture just below the mouth of the esophagus, probably due to spasm resulting from a fissure. Cicatricial stenosis of the mouth of the esophagus or of the esophagus itself may occur and may be seen on roentgen examination. Roentgenological examination should therefore always be performed before instrumentation of the esophagus be attempted.

Esophagoscopy may show fissures, leucoplakia, or extensive erosion of the mucosa in the upper part of the esophagus. These lesions may cause spasm, cicatricial stenosis, or even esophageal carcinoma.

A controversy still exists as to the reason for the atrophic changes of the skin, mucous membranes, and nails. It is thought that iron deficiency and inadequate diet are responsible for these lesions. Frequently, all symptoms disappear upon simple treatment of the mouth of the esophagus with a bougie.

The author presents 6 cases of the Plummer-Vinson syndrome, together with excellent roentgenographic reproductions. LUTHER H. WOLFF, M.D.

Toellner, H. M. A Contribution to the Pathology of Esophagitis (Beitrag zur Pathologie der Oesophagitis). Jena Dissertation, 1939.

On the basis of cases described in the literature, and 7 of the author's own cases, which he was able to

flow clinically and post mortem, this contribution is made to the pathology of esophagitis.

A sixty-five-year-old woman, who had suffered from attacks of vomiting for forty-five years, died eighteen days after removal of perforated gall bladder. At autopsy the esophageal mucosa was found to be thickened and thrown into longitudinal folds. An eighty-year-old girl died of sepsis following osteomyelitis of the thigh. Her esophagus showed marked folding of the mucosa with numerous superficial ulcers vertically arranged. An eighty-one-year-old woman with clouded consciousness vomited frequently. The mucous membrane of the esophagus there were numerous mucus and pus cysts, also frequently in the long axis. The next cases presented acute disturbances of consciousness from accidents. In both, there were no local defects in the lowermost portion of the esophagus. In the last cases the patients died of carcinoma of the colon; they also showed severe inflammatory changes in the esophagus, marked fold formation and occasional ulcers.

From these findings, it is seen that esophageal damage is not a disease entity but is produced by the underlying disease. In all cases, there is disturbance of consciousness and, frequently, there is vomiting. These conditions are due to disease of the digestive organs or to a lesion of the central nervous system. For correct interpretation of the pathological changes found in the esophagus, two observations must be kept in mind.

The stomach attempts to heal existing gastritis by forming mucosal folds, so that portions of the mucosa are protected from the effect of the gastric juice.

Complete interruption of the vagus nerve causes relaxation of the esophageal musculature and spastic contraction of the cardia, whereas stimulation increases the tone of the musculature and relaxes the tone of the cardia of the cardia of the esophagus. The esophagus responds to stimulation by longitudinal fold formation; the cardia is opened, and gastric juice flows into the esophagus. There are no primary disturbances of the esophageal mucosa aside from malformations, corrosions or trauma.

(SALZER) LEO M. ZUCKERMAN, M.D.

Wachs, E. The Methods and Results of Treatment of Cardiospasm (Ueber Methoden der Kardiospasmenbehandlung und ihre Erfolge). *Deutsches Archiv für Chirurgie*, Berlin, 1930.

In Fromme's Clinic a total of 5 patients (3 women and 2 men) were treated during the last sixteen years by various methods for cardiospasm. The former purely surgical treatment was replaced by the bloodless Starck sound dilatation method because of the excellent results obtained by the latter procedure. The treatment of choice is that remains the bloodless sound dilatation, which is one of the most useful procedures and, therefore, is entitled to first place as the most justifiable method for treating cardiospasm. Only

after failure of the dilatation method due to cicatricial stenosis or to the impossibility of introducing the cardiodilators through markedly narrowed or difficult indentations of the esophagus, are operative interferences indicated. Sixteen patients were treated operatively by temporary gastrostomy as an emergency operation, by Heller cardiomyotomy, by cardioplasty, and by Hevovsky gastro-esophageal anastomosis. The last-named method unquestionably yielded the best results, anatomically and functionally. All these patients (the operations were undertaken in 1 patient fourteen years ago, in 3 eleven years ago, in another 3, ten years ago, and in 10 little over one year ago) remained symptom-free and able to work. None of them ever had return of the dysphagia.

The roentgen re-examinations also revealed permanency of the dilated esophagus without any tendency toward contractions, thus proving this as the best method for assuring a near normal organ. Good results may also be obtained by the Heller cardiomyotomy. It is striking, however, to note reports of comparatively high rate of recurrences following the Heller operation. The literature. The results of the plastic operations are not especially favorable, functionally nor anatomically. All of the patients retained deglutitional annoyances; their roentgen reports showed the esophageal dilatation nearly unaltered and great expansion of the same still in evidence. Twenty-six patients, whose ages ranged from seventeen to fifty-eight years, were treated with the Starck inflexible dilator. The results are very good, even excellent, in 14 patients. These patients have absolutely no dysphagic symptoms and are really cured. The cure apparently lasted six years in 3 of these patients, five years in 3, four years in 3 others, four years in 1 patient, and 1 year in 1 other patient. The results of the dilatation method in 12 patients are good without doubt. However, these patients complain of an occasional dysphagia but remain able to work and do not show any signs of nutritional disturbances. It is acknowledged that following the bloodless dilations, the expanded esophagus does not shrink materially in some patients, yet this treatment left the patients entirely free from all symptoms of dysphagia.

If ever it is the cure following the dilatation method is judged by the roentgen plates, the results would not be so favorable. In some of the patients the esophagus resumed nearly normal contour after bloodless dilatation of the cardia. An unfavorable result after dilatation treatment is never observed; the clinic but patients that are treated before entering our service are lost because of perforation of the esophagus by consequent mediastinitis. Occasionally ruptures of the esophagus resulting from the bloodless dilatation treatment are reported; therefore, this treatment should not be classified as non-hazardous even though the danger is practically minimal when compared with the dangers of operative procedures.

SURGERY OF THE THORAX

In the discussion MARTIN was glad to note that after doctors treated cardiospasm with all the various surgical methods, the author's report established the fact that a return to the dilatation sound method is again the vogue. Martin recommended this method for forty years, during which time he has employed it in numerous patients and obtained good and lasting results (*Mitt u. Grenzgeb d. Chir. und inn. Med.* 1900). It made no difference to him whether the dilatation sound of Gottstein or of Starck was used, the result was essentially the same. Both are good.

In the more unusual cases in which the small sounds cannot be forced through the esophagus a gastrostomy is done to maintain nourishment, then the employment of fine buckshot and thread, according to Von Hacker's method of sounds, is resorted to *ad infinitum*. As soon as a noticeable dilatation has been forced, the dilatation from pharyngo-esophageal entrance with sounds is undertaken and continued until a maximal expansion is obtained. This returns the function of deglutition to the normal status, and it will remain normal if the sound treatment is repeated at regular intervals. Prevention of stenosis is the main issue as this will also prevent the appearance of stenosis. means no recurrences. This positive statement is supported on the basis of his very numerous successful experiences. Only in the most unusually exceptional cases one of the complicated operative methods was found to be necessary. Martin had very fortunate results with dilatation treatment.

ANSCHUTZ found no lasting results with the end-less sound dilatations. Dilating with the fingers was given up by Mikulicz in favor of the Gottstein sounds. Even this is not sufficient in some cases, according to the anatomical location, muscle splitting or anastomosis must be done. Unfortunately Anschutz had no experience with suggestion therapy. Two cases of polyserpism were reported by Anschutz: the pylorospasm developed after gastrostomy with suspension of the gastro-enteroscopy function and after the introduction of a tube into the lower bowel enterospasm occurred. The patients then died.

One case that of a young girl twenty-two years old with cardiospasm, and another case, that of a woman forty-two years old, with esophageal ulcer, were reported by Frey and Plenk, respectively. No information was obtained by section, and there was no evidence of peritonitis.

(1 Wacker) WATHIS J. SIEFERT, M.D.

MISCELLANEOUS

Bergensfeldt L. A Contribution to the Knowledge of Diaphragmatic Hernia (Ein Beitrag zur Kenntniss des Zwerchfellbruchs) *Acta chirurg. Scand.*, 1909, 53, 519.

After discussing the embryology and anatomy of the diaphragm the author proposes to classify diaphragmatic hernias into three groups:

- 1 Congenital
 - 2 Acquired non traumatic
 - 3 Acquired traumatic
- In all the groups true hernias (with sac) and false (without sac) may be found. As congenital diaphragmatic hernias often remain symptomless for years, it may be difficult to decide whether or not such hernias are congenital in adults. The author reports the following 3 cases.

Case 1. A boy of one and one-half years had suffered from various gastric complaints since the age of three months. Six weeks before this writing he had hematemesis (about 3 teacups of blood). An x-ray examination revealed a normal esophagus, but there appeared a "bubble" in the chest, which was clearly identified as a part of the stomach which had been displaced into the thorax through a para-esophageal hiatus hernia. This roentgen diagnosis was affirmed by operation. Through an upper median laparotomy with resection of the end of the sternum the stomach was pulled down into the abdomen and the hiatus opening was closed with catgut sutures. The recovery was uneventful, and an x-ray check-up before discharge and follow-up examinations when the patient was two and one-half and three and one-half years old showed normal findings. The patient has not had any of his former complaints since the operation.

Akerlund differentiates pathologically the following forms of hiatus hernia:

- 1 Hernias with congenital shortening of the esophagus. In this type the distal part of the esophagus has not descended through the diaphragm. As no effective surgical treatment is possible, these hernias are of but little practical interest.
- 2 Para-esophageal hernias, in which the stomach or any other abdominal organ, after normal descent of the cardia, has ascended aside of the esophagus.
- 3 The so-called acquired hiatus hernias, in which the distal part of the esophagus, after normal descent, has ascended with adjoining parts of the stomach into the thorax.

The author's first case obviously belonged to Group 2.

Case 2. A boy of four years had had an attack of violent pains in the whole abdomen with vomiting when he was three. Three days before admission, another such attack with incessant vomiting and pain had begun and had persisted. There had been no bowel movement. On admission there was no meteorism, and the abdomen was rather negative. The heart was found displaced to the right, the anterior wall on the left side of the chest revealed distention, and the breathing sounds were missing. Intestinal sounds were audible. Roentgen examination revealed the presence of a part of the colon in the left chest, it was full of gas and revealed fluid levels.

An intercostal incision was made in the left seventh interspace with wide opening of the thorax. The left pleural cavity was almost entirely filled with intestine. In the apex was the hepatic flexure.

with the spleen. In addition, about half of all the small intestinal loops and the transverse and the descending colon were in the chest. There was no peritoneal covering forming a hernial sac. The opening of the hernia was about 3 cm. in diameter in the posterior lateral part of the diaphragm. Reposition could not be done without enlargement of the opening. There were no marked strangulation rings on the intestines. The opening was closed, and because of weakness of the muscle layer closure was difficult and had to be accomplished partially by obliteration of the complementary space with sutures. Recovery was eventful with chicken pox, wound suppuration and pleural exudation, mastoiditis and erysipelas of the face. Finally recovery took place. X-ray check-up showed normal findings, did a follow-up examination after one year. Undoubtedly this had been a congenital hernia.

Case 3. A woman of forty-nine years had had stomach complaints from her fifteenth to her thirtieth year. In 1913 she had been operated upon for adenomatous goiter. In 1932 there were recurrence of the goiter and hoarseness. Lately she had had vaginal symptoms. On admission in August 1934, she was found to be very fat with slight deformity. On the left there were dullness and diminished breathing sounds. Roentgen examination of the intestinal tract, by means of barium-enema displacement of the basal flexure into the left chest and contrast meal, showed the stomach to be rotated and displaced into the left chest where it lay behind the colon. In view of the general condition of this patient operation was not believed to be indicated. This case showed that diaphragmatic hernia can be latent for some period of time.

As to symptomatology, diaphragmatic hernias usually are not diagnosed without x-ray studies; they are suggested by the combination of abdominal and thoracic signs and symptoms which they produce. The most frequent abdominal symptoms are pains localized in the epigastrium or in the left

upper abdomen. If the stomach is herniated, stomach symptoms prevail. If the intestines form the content of the hernia the symptoms will be determined chiefly by the impaired passage and an ileus-like picture will develop. The thoracic symptoms are pain, oppression, dyspnea, cyanosis, angina pectoris and coughing spells. Dextrocardia is an important objective sign in hernias of the left side and percussory changes and auscultatory findings often accompany them. Typical intestinal sounds heard over the chest are significant especially when in the upper half of the chest there is transmission from the abdomen is impossible.

Effective treatment is obtained by surgery only. However surgery is limited to a certain second group of cases. In the first group the congenitally shortened esophagus prohibits operation, and in the third, there is very often no major discomfort. The latter group occurs chiefly in senile people. Laceration, of course, is always an absolute indication. Younger people probably should always be operated on when the diagnosis is made. In older people only major discomfort justifies an intervention. The author's third case demonstrates the importance of early diagnosis. If the condition had been diagnosed between the fifteenth and thirtieth years, the general condition would have permitted an operation. However an operation could not be done on recurrence of the symptoms at the age of forty-nine. In early infancy conservative treatment is justified as diaphragmatic hernia in infants may heal spontaneously.

As to the operative procedure some authors choose thoracotomy and others laparotomy. Like the majority make individual decisions according to the location of the opening. While surgeons in general might be inclined to consider the laparotomy route as less dangerous, this is not borne out by the statistics of Hedblom who found in 378 cases a mortality of 19.8 per cent following thoracotomy and mortality of 3 per cent following laparotomy. HARRISON LAMM, M.D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Uggeri, C. Hernias of Epiploic Appendices and Their Complications (Le ernie di appendici epiploiche e le loro complicanze) *Ann ital di chir*, 1940, 19: 215

Uggeri recalls the anatomy of epiploic appendices and points out that at times they contain an intestinal diverticulum. Their morbid complications consist of mechanical impediment to the circulation by direct pressure or torsion, infection, and adhesions which may lead to intestinal obstruction. Epiploic appendices may penetrate into a hernial sac. This occurs more frequently on the left side, in males, and in advanced age, and depends on the number, volume, and form of the appendices and on the degree of mobility and ptosis of the intestine, especially the sigmoid colon. Hernia of epiploic appendices is rather frequent and gives rise to complications in a large percentage of the cases. The author reports 9 cases, 6 of which were complicated by strangulation or torsion. The appendices, especially in case of torsion, often contract adhesions of their distal extremity with the hernial sac, because of the continuous irritation caused by their backward and forward movement in the sac. They may be transformed into fibrous cords and their pedicle may become long and thin and even rupture, a foreign body being left inside the hernial sac. In recent cases, the changes found were those of strangulated epiploon. Usually, the amount of fluid in the hernial sac is small and may be serosanguineous or seropurulent.

Hernial epiploic appendices may give rise to various complications of which the author presents examples taken from the literature. Simple strangulation occurs mostly in old, irreducible, and well tolerated hernias, but it may also be the first sign of a hernia. Pain is the principal symptom; it is felt in the hernia and radiates to the abdomen or the umbilicus; the general condition is always good. In most cases, there are no symptoms of obstruction. Intrahernial torsion presents the same symptomatology but at times there are temporary attacks of pain which precede the appearance of the final syndrome and which are interpreted as abortive phenomena of torsion. The torsion is nearly always single, even if several epiploic appendices are present in the hernial sac; its mechanism is still unknown. Torsion is often accompanied by strangulation and then occurs first. Intrahernial foreign bodies are an operative finding and originate through destruction of the pedicle of an epiploic appendix, especially in the subacute form of torsion. The adhesions contracted by the distal part ensure its nutrition and prevent its necrosis. Geniculation with adhesion of the sigmoid to the hernial opening has been reported in case of incarceration of an epiploic appendix and

may give rise to symptoms of intestinal obstruction. Hernial diverticulitis has been described in 1 case only.

If left alone, the complications of hernial epiploic appendices may gradually become worse until an urgent intervention is found necessary, or they may improve gradually and disappear completely. It is best to intervene as soon as possible in all cases; the result of the operation is practically always good. Hernial diverticulitis seems to be the most unfavorable complication, probably the only instance of death was caused by diverticulitis. The treatment is that of any hernial strangulation. Simple reduction into the abdomen of a strangulated or twisted epiploic appendix is to be condemned. Ligation of the pedicle and resection of the appendix, cauterization in case of doubt as to whether a diverticulum has been opened, and, eventually, burial of the stump are recommended. Radical treatment of the hernia is done at the same time, except in clearly infected cases.

RICHARD KEMEL, M.D.

Coenen, H. Gas Peritonitis (Die Gaspertonitis) *Zentralbl f. Chir*, 1939, p. 5221

Coenen collected the records of 75 cases of gas or air peritonitis and attempted to determine the causes. The clinical picture he reports develops slowly with gradually increasing pain and a collection of gas in the peritoneal cavity which causes a widening of the costal arch, decreased liver dullness, and labored breathing. Peristalsis is preserved. Signs of peritoneal infection are absent early but may appear later. If the abdomen is opened, a large amount of odorless gas escapes explosively. The intestines are pressed together. In 39 cases smooth healing was observed, 28 patients died later of peritoneal infection.

In 32 cases the gas in the peritoneal cavity was caused by a ruptured peptic ulcer. The reason that the gas which leaks into this cavity does not cause an infection can be one of two. One is that a closed valve is produced by the liver or some other viscus which is pressed against the opening by the gas. The other reason is that the infection might be prevented by the acid gastric secretion while the gas is permitted to rise to the diaphragm. Graumann has recently reported 7 silent gastric perforations, all of which healed without surgical intervention. A similar picture may also develop from perforation of the small bowel either by a perforating injury as described by Nini and deMassie, or from an infection such as tuberculosis or typhoid. Fifteen cases of pneumoperitoneum caused by perforation of the large bowel were collected by Coenen. Two of these were caused by perforation of diverticula. Of interest are several cases of pneumoperitoneum which developed through injury of the abdominal wall in which atmospheric air was admitted through a

valvular mechanism. These cases must be differentiated from pneumoperitoneum by gas formation. Loehr studies showed that the specific gas producing bacteria never develop in the abdomen. Because of this evidence and because intestinal perforation is difficult to demonstrate in infants at necropsy it is difficult to accept Obadale's explanation of his case of genuine gas peritonitis in an infant. Of course the aerobic bacilli could produce gas in the abdominal cavity but this is foul smelling whereas the gas of pneumoperitoneum is odorless.

The treatment of pneumoperitoneum is quite clear if pneumoperitoneum with peritoneal infection is present, the surgeon must find the cause and close off the gastric or intestinal opening, as the case may be. R. LOEHR, M.D.

GASTRO-INTESTINAL TRACT

Martini, T. Bianchi A. E., Oliver, G. G. and Wybert A. The Diagnosis and Treatment of Profuse Gastro-Intestinal Hemorrhages (Diagnóstico y tratamiento de las grandes hemorragias gastro-intestinales). *Rev. Soc. Med. Argent.* 940: 54, 59.

The authors discuss the treatment of grave gastro-intestinal hemorrhages caused by intrinsic lesions as well as by certain infectious diseases, toxic conditions and other pathological processes responsible for a hemorrhagic diathesis.

Before an therapeutic measure is considered, a definite diagnosis should be made particular attention being paid to extradiagnostic conditions, such as lesions of the spleen or liver, hemolysis, cutaneous or chronic pancreatitis, leukemia, hemophilia, uremia, and septicemia. The examination should include determinations of the urea and sugar content of the blood. Gastro-intestinal lesions leading to profuse hemorrhages may be divided into four groups: (1) local changes caused by tumors or ulcers; (2) post-operative local changes; (3) cryptogenic conditions; (4) those of an obscure origin and (5) hemorrhagic colitis caused by polyps, tumors, diverticulitis and appendicitis.

The conservative treatment blood transfusion occupies the main place; the mechanism of its effect is manifold: it increases the tonus of the blood vessels, acts as a substitute for the lost blood mobilizes stored blood, stimulates the hemopoietic stem reaction, establishes the acid-base equilibrium, displaces hemoglobin bactericidal, and its toxic effect and has certain value from the viewpoint of organotherapy.

Coagulation treatment is recommended by the authors for cut hemorrhages caused by gastric or duodenal ulcers, but chronic recurrent bleedings responsible for secondary anemia is considered an absolute indication for an operation to be performed under local anesthesia after preceding blood transfusion. Partial gastric resection is recommended by the authors.

Thrombocytopenic purpura, primary thrombophlebotic splenomegaly and splenic anemia are best treated by splenectomy.

Diarrhea responsible for grave hemorrhages calls for resection of the involved segment.

JOSEPH K. VALLI, M.D.

Knaump, D. H., and Parsons, J. C. Extramural Atonemia in Gastro-Intestinal Hemorrhage: (1) General and Clinical Considerations; (2) Experimental Observations. *Am. J. Dig. Dis.* 940: 7, 80, 91.

In recent years atonemia has been found in a number of disease states for which no renal lesion can be demonstrated. The authors became interested in that form of extramural atonemia associated with gastro-intestinal hemorrhage because of a case of bleeding peptic ulcer which came under their observation.

On admission to the hospital, the patient's blood urea was 60 mgm per cent, and this gradually dropped to normal over a period of ten days. The authors are impressed by the urinary excretion of chlorides which was exceedingly low (about 30 mgm per cent of sodium chloride) in spite of an adequate volume output of urine (from 2000 to 3000 ccm per day). The blood urea returned to normal before the plasma chlorides or the urinary chlorides began to show any significant rise. The authors believe that this is an indication that the blood-chloride concentration per se has little to do with the elevation of the blood urea. A number of possible explanations for the elevated blood urea are found in the literature: bacterial decomposition of blood lying in the intestine, increased protein catabolism, impaired renal function per se or associated with lowered blood pressure due to blood loss and certain other conditions.

The authors produced extramural atonemia in dogs by removing blood from the heart and placing it in the gastro-intestinal tract with stomach contents. This was characterized by a rise in the blood urea value, the first from thirty to forty-four hours, and the second from forty-two to forty-eight hours after the beginning of the experiment. When fasting dogs were used, and when one group lost blood only and the other as fed blood only, this double curve could be dissociated into its component factors. Thus, the initial rise was produced by the feeding of the blood and the secondary rise was due to the loss of blood. Both elevated values (maximum, 3 per cent above normal) fell within a few hours and both were accentuated if food of high protein content was given. Plasma-chloride and urea-ratio determination values were not significantly altered in any of the experiments. Hypochloremia, hemocoagulation, and dehydration played no significant role in this form of extramural atonemia. The rise in blood urea was due to several factors: (1) the stimulation of the ingested protein and digestion products of the whole blood in the gastro-intestinal tract, and (2) an increase in protein catabolism. In no instance did an animal assume the clinical picture of uremia.

ARTHUR JOYCE, JR., M.D.

De Vincentiis, A. Experimental Gastric and Intestinal Mycosis (*Micosi gastriche ed intestinali sperimentali*) *Clin chir*, 1940, 16 205

The author briefly reviews the subject of primary mycotic infections of the digestive tract and particularly of the stomach. Primary gastric actinomycosis is a rare disease. The first case was reported by Israel in 1888. Other cases were subsequently reported by Grill in 1895, Prutz in 1897, Duckworth in 1900, Robinson in 1911, Pohl in 1912, Hadjipetros in 1925, Zuckschwerdt and Eck in 1932, and Strawinski in 1936. The lesions are characterized by ulcerative necrotic hemorrhage and, in some cases, by granulation tumors and fistula formation. It is generally agreed that the infection enters through the mouth. It may be caused by the ingestion of infected meat, by carious teeth, or by secretions of pulmonary foci. Means of spread to the stomach or intestine are by direct extension from neighboring foci or, rarely, by the blood stream.

Experimental observations on gastric actinomycosis are rare. These are briefly reviewed by the author. He states that Lichtheim reproduced the lesions in rabbits.

The author performed a series of experiments on rabbits to establish that growth of fungi in the gastric and intestinal regions was possible and to determine the easiest means of growth and the anatomicopathological alterations. The fungi employed were *mycotrula albicans*, *sporotrichum bermanni*, and *actinomyces albus*. The experiments were divided into three groups, each containing 12 animals. In Group I, $\frac{1}{2}$ c cm of the fungus solution was injected with a fine needle into the gastric and intestinal wall. In some of the animals of Group II $\frac{1}{2}$ c cm of the solution was injected into the gastric and right or left epiploic arteries, and in the others into the superior and inferior mesenteric arteries. In Group III the fungus was given to the animals by mouth for nine days by placing it on cabbage leaves which were eaten. A gastrostomy or enterostomy was also done and excoriations of the mucosa were made with the needle. All the animals were killed ten, twenty, thirty, forty, sixty, or eighty days after inoculation.

The experiment on each rabbit is reported in detail. It was found that the lesion was most difficult to reproduce when the fungus was introduced by mouth (2 of 6 gastric and 1 of 6 intestinal lesions), whereas intramural inoculation was easiest (10 of 12 gastric lesions).

The lesions produced in the stomach and intestine had a hyperplastic granulomatous character. The center of the lesions contained necrotic substances and fungous elements mixed with polymorphonuclear and mononuclear. Surrounding this center was a layer of leucocytic infiltration containing epithelial and histiocytic cells. More peripherally there was considerable connective tissue with numerous fibroblasts and newly formed vessels. The degree of connective-tissue formation varied proportionately with the period of time after inoculation.

From these observations the author concludes that the stomach and intestine are organs which can be infected by fungi, that the easiest means of infection is by submucous or endoarterial inoculation and that the lesions produced are characterized by a granulomatous hyperplasia with a tendency toward encapsulation and perhaps toward spontaneous resolution.

MICHAEL DEBAKEY, M D

Mann, W N, Sundberg, S, and Herbert, W E. Cancer of the Stomach in London, in Stockholm, and in Amsterdam. *Gut's Hosp Rep*, Lond, 1939, 89 274

The object of the present investigation was to compare the frequency of cancer of the stomach in comparable groups of patients in London and in Stockholm, and then, by comparing the habits and dental conditions of this same group, to determine whether any factors exist in those habits which might be favorable to the development of cancer of the stomach.

The total incidence of cancer in all European races and in the various social divisions of those races is remarkably constant. It was amply demonstrated that cancer of the stomach is more than twice as common in Sweden and in Holland as it is in England. The figures indicating the masticatory surface show that the Dutch are superior to the English in this respect, while the Swedish are far worse. Gross oral sepsis, on the other hand, is much more common in the Dutch and Swedish groups than in the English. It may be observed here that a relationship between oral sepsis and frequency of cancer of the stomach is seen in England when the incidence is analyzed according to social classes. The poorer classes have a greater degree of oral sepsis and a higher incidence of gastric cancer than the well-to-do. No conclusion can be drawn about the importance of the temperature at which food and drink are taken nor about the use of tobacco.

The importance of the extrinsic factor in the development of new growth is discussed with special reference to the incidence of cancer of the stomach in various European countries. JOHN W NOZUM, M D

McClure, R D, and Fallis, L S. Partial Gastrectomy: A Consideration of Certain Technical Problems. *Ann Surg*, 1940, 111 743

The mortality of subtotal gastrectomy for peptic ulcer in the authors' clinic for a fifteen year period was 10 per cent, and for the last five years 5 per cent. In the last consecutive 53 cases there was but 1 death. The most important factor in this falling mortality has been the increasing experience of the operators which resulted in several improvements in technique, these are discussed in detail. Important points in preoperative preparation are care that the hemoglobin is at least 70 per cent, attention to dental prophylaxis, refusal to operate within six weeks of an upper respiratory infection, repeated lavage of the stomach with bicarbonate of soda solution in the two days before operation, final pre-operative lavage

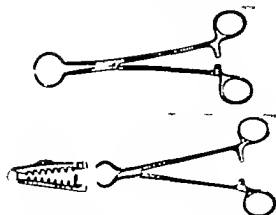


Fig. 2. The ring clamp for applying traction to the duodenum.
Fig. 3. The modified Furness clamp with its detachable handle.

with half-strength beryl-chlorometa-cresol (300 c.c.m. being left in the stomach) and repeated enemas to cleanse the colon. The anesthetic of choice is spinal suferaine administered by the Jones method. Sedation is accomplished by means of seconal (3 gr.) and morphine sulfate (1/4 gr.). Blood pressure is maintained by the administration of 600 c.c.m. of 5 per cent glucose followed by 600 c.c.m. of citrated blood. A midline incision is used.

The duodenum is mobilized, after cutting the right gastric artery, with the aid of a special ring clamp which encircles the prepyloric area as a retractor. It is sectioned distal to the ulcer. If this is possible without encroachment on the common bile duct or the papilla of Vater. If this is not possible as may occasionally be ascertained only after opening of the duodenum the section is made through the lacer or proximal to it as circumstances indicate. Closure of the duodenal stump is then made with the aid of modified Furness clamp, which is furnished with detachable handle and is easily manageable deep wound. A purse-string suture, interrupted Lambert sutures, and omental reinforcement complete the closure.

From two-thirds to three-quarters of the stomach should be removed. The left gastric artery is ligated near its origin and the stomach divided between two crushing Payr clamps, the proximal clamp having wing nut on its tip to prevent slipping. The Hofmeister-Finsterer type of anastomosis is preferred, which brings the jejunum through the rent as far posteriorly as possible in the transverse mesocolon. The part of the cut end of the stomach other than the anastomotic site is closed by double layer of continuous sutures, and an additional row of interrupted Lambert sutures. Precautions to be taken are the use of guy sutures to avoid kinking or rotation of the jejunum, the inversion of the posterior

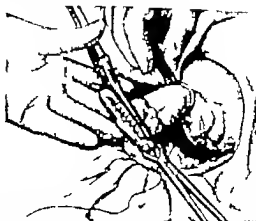


Fig. 3. Duodenum just before sectioning. The McClure modification of the Furness clamp is shown in place, with the ring clamp just proximal to the pylorus.

(Courtesy of J. B. Lippincott Co.)

continuous suture well toward the mesenteric border of the jejunum so that sufficient jejunal wall is left for the remainder of the anastomosis, and the accurate closure of the rent in the mesocolon around the stomach or the two arms of the jejunum, as the case may be. Important structures of which damage should be avoided are the common bile duct and the middle colic artery. Drainage is used only in cases of injury to the pancreas or when there is necrosis about the integrity of the duodenal closure.

Important points in postoperative care are continuous gastric suction for four days with only sips of water or ice allowed by mouth and subsequent conservative attitude with regard to increasing the diet. Alkaline powders and naphthalenol are given regularly postoperatively. RICHARD WARREN, M.D.

M. Kitterick, L. S., and Harris, E. F.: Acute Mechanical Obstruction of the Small Bowel. *New England J. Med.* 1940, 6.

This is the fourth report and analysis of the cases of obstruction of the small bowel occurring in the surgical service of the Massachusetts General Hospital. It affords an unusual opportunity for comparison of the results of treatment over a period of forty years. Strangulation obstruction has been recognized as the greatest factor in the mortality of these cases. Early diagnosis and early operation have thoroughly been justified in the minds of every staff member of the hospital. The hazards of certain cases of late obstruction are well known and the gangrenous bowel obstruction is best treated by simple drainage of the distended loop without exploration.

There were 36 patients in the group with acute mechanical obstruction of the small bowel. From 70 to 80 per cent of all these patients had previous laparotomy. Six per cent had been operated on for a

previous obstruction. Pain was the most common symptom present in 98 per cent of all the patients. The onset of this pain was sudden and colicky. Vomiting was present in 93 per cent of the cases. The so-called fecal vomiting was a late symptom. There was cessation of bowel movement and passage of gas following the onset of pain. The temperature was normal or even subnormal unless gangrene and perforation had resulted.

The so-called "scout" roentgen film of the abdomen is the most important single objective finding in the patient with obstruction of the small bowel. Its value from a diagnostic standpoint cannot be overemphasized. Two views are taken, one with the patient supine and the second with the patient in the sitting position. The former is superior for the gas pattern of the small bowel, the latter is superior for the determination of fluid levels. The characteristic step ladder arrangement occurs only in the later stages.

It should be stated that there are times when the roentgen findings are most confusing.

The diagnostic criteria in acute mechanical obstruction are a history of sudden and usually severe abdominal pain, colicky in nature, in a patient with previous laparotomy, vomiting, usually following the onset of the pain, evidence of one or more distended loops of small bowel, as revealed by a "scout" roentgen film of the abdomen, and active, high pitched peristalsis which is audible over the abdomen.

Acute obstruction of the small bowel usually occurs at a single point and is caused by a band or adhesions from a previous operation. Eighty-one per cent of the 136 cases had a single point obstruction and simple release of this was sufficient to bring about rapid recovery. A single-point obstruction more completely predisposes to the development of gangrene of a segment of bowel than obstruction which is more adhesive and in which longer segments of bowel are involved.

There were 136 cases fulfilling all the requirements of acute obstruction of the small bowel. Eight patients were not operated on because of spontaneous recovery. Twenty-seven patients died, and 4 were not operated on in this group. The hospital mortality was 20 per cent. Of the group of 124 patients operated on, 23 died, giving a surgical mortality of 18 per cent.

In addition to a careful history and physical examination, the routine use of the "scout" film of the abdomen should make possible a definite diagnosis of early obstruction of the small bowel in a high percentage of all cases.

Strangulation is the most important single factor in determining the outcome of a case of acute obstruction of the small bowel. It was present in 33 per cent of the total group and was the cause of death in more than half of the fatal cases. Certain factors other than strangulation contribute to the high mortality, chiefly age and duration of the obstruction. The mechanical factor of bowel dis-

tention may be an important matter. The most important essential for successful operation is that the patient present himself for treatment within the first twenty-four hours of the onset. After twenty-four hours have elapsed, other factors such as distention, dehydration, and chemical imbalance rapidly assume importance. The degree of dehydration and chemical imbalance should be evaluated and appropriate methods of relief instituted. Blood transfusions are essential for certain patients with strangulation obstruction. Simple drainage of the strangulated loop of distended bowel without exploration or resection will further lower the operative mortality in most instances.

JOHN W. NUZUM, M.D.

Harrison, H. The Importance of Simple Ulcer of the Right Side of the Colon in Diagnosis of Abdominal Disease. *Arch Surg*, 1940, 40: 959.

The writer presents a study of 6 instances of simple ulcer of the cecum and ascending colon. The difficulties of clinical diagnosis, the serious nature of the complications of the condition, and the unknown etiology and pathogenesis indicate that this type of intestinal ulceration deserves more study and investigation. Perforation of the bowel occurred as a result of the inflammatory process in 4 of the patients. It is apparent from the study of barium enema plates that the correct diagnosis cannot be made by means of this study alone although it may contribute valuable evidence.

The complications arising from simple ulcer of the colon give rise to a very high mortality. Perforation of such lesions may simulate perforation of an acutely inflamed appendix or may exhibit and mimic appendiceal abscess. Differentiation from perforated duodenal or gastric ulcer may be difficult.

JOHN W. NUZUM, M.D.

Szacsvay, I. The Results of Treatment of Perforated Appendicitis Based on Ten Years' Material (Erfolge in der Therapie der durchgebrochenen Wurmfortsatzentzündungen auf Grund des 10jährigen Materials). *Arch. chir. Klin. Univ.* 1939, p. 205.

Appendectomy for acute and chronic inflammation of the appendix was performed 1,552 times. The mortality rate was 0.25 per cent. In the treatment of perforated appendicitis quite different results were obtained. All cases of the latter type were divided into the following two groups: (1) cases in which the entire peritoneal cavity was involved or became involved during the operation, and (2) cases of localized peritonitis. The severity of the disease and, in turn, its prognosis depend not only on the extent of its spread and on its duration, but—and this is probably of the greatest importance—on the nature and virulence of the infecting organism, and on the capacity for resistance of the peritoneum and of the body as a whole. There were numerous patients with an extremely severe process of from three to five days' duration who quickly re-

covered following operation. On the other hand, some patients who were operated upon one or two hours after perforation, who received particular care, and in whom the abdominal cavity contained only very moderate amount of serosal exudate, died. Ljunggren, from a statistical study of nearly entire districts established the fact that the mortality from perforated appendicitis during the last ten years was worse than that of the preceding ten years. He concluded that appendicitis had become more virulent in spite of the continuous improvement in recent years of technique, antiseptic methods of treatment and serum therapy. The statistics of the Clinic yielded a mortality rate of 6 per cent in a single year and of 37 per cent in another similar one. This indicated a certain increased virulence of appendicitis.

There are many differences of opinion regarding the treatment of this disease. The questions arise whether or not to irrigate the abdominal cavity and whether or not to drain it. Many and varied opinions in regard to the value of serum therapy are also heard. At the Clinic all cases are operated upon as soon as the diagnosis of appendicitis is established. The appendix is removed if at all possible. If its removal means the breaking down of localizing barriers and by this dissemination of the infection the appendix is left in place and the incision cavity is drained. With diffuse processes the abdominal cavity is not irrigated. The inflammatory exudate in the abdominal cavity and especially that in the pouch of Douglas is sponged out dry. The adjacent intestines are separated by spatulas protected by tampons, which permits access to the deeper parts. Drains are always placed in the pouch of Douglas. For this purpose gauze strips enveloped in rubber drainage tubes, or large caliber glass rods with perforations in the side through the lumina of which gauze strips are drawn are used. Eleven patients were treated with Coliperin serum given intra-abdominally or intramuscularly. Of these 7 died. Of 8 successes with 5 deaths, 4 were under the diaphragm with deaths. Suppurative pleurisy developed in 3 and pneumonia in 4 of the 5 fatal cases. Post-mortem examination revealed peritonitis. 6 of the cases. Of 95 patients with diffuse peritonitis who were operated upon, 64 died. Eighty-two per cent of those with perforation of the appendix who were operated upon came from the surrounding villages. Extraordinarily neglected cases are among these.

From these observations, it must be concluded that appendicitis in general is from time to time more virulent and consequently the results of treatment are poorer. These facts must be kept in mind when one is confronted with making a decision regarding the type of operation and the method of treatment. Moreover it is certain that, to be of value, information in regard to the treatment of appendicitis should be based only on results which are collected over long periods of time.

(E. Lills). EDWARD W. GREEN, M.D.

Sommer G. Testicular Atrophy Following Extirpation of the Rectum (Hodenatrophie nach Mesenterektomie) *ag. Brab. His Chr.* 1907, 457

Little has been published concerning the disturbances of testicular function following extirpation of the rectum (Bauer, Dick, Goepel, Goetze). In 9 personal cases of the author consisting only of younger patients in whom amputation and resection of the rectum or abdominopelvic extirpation had been done, such disturbances occurred 6 times. Four patients complained of severe diminution of libido and potency, the volume of ejaculation was less, and the testicles had become smaller and softer. In 5 of the patients, on the other hand, there was to be noted transitory increase of the sexual vitality with a subsequent decrease. In a biopsy study of the testicle of a forty-eight-year-old man, there were to be seen considerable degenerative changes in the epithelial cells, the basal membrane was more strongly developed, the connective tissue was more abundant and appeared sclerotic, and the interstitial cells of Leydig were absent. The cause for these changes may lie in the inadequate irrigation of the blood vessels (the testicular arteries rising from the arteria spermatica interna and the arteria deferentia arising from the arteria vesicalis). Thus, however, does not appear to be certain that the thoracic deep communication exists between the two vessels, but is finger breadth above the point of the epididymis. It is also unbelievable that the vas deferens should be severed so frequently. It is much more likely that an injury of the autonomic system may be the underlying cause. The lower portion of the autonomic cord runs near the midline and extends to the coccyx. An injury of this portion of the cord leads to temperature elevation and through this to testicular atrophy.

HANS A. SALTIN, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Sandström G. Congenital Anomalies of the Biliary Tract (Anomalie congenite delle vie biliari) *Cla. Br.* 1910, 67

The author states that anomalies of the biliary tract occur with sufficient frequency to be of clinical significance. He emphasizes the surgical importance of knowledge of these anomalies. He reports a case of a twenty-two-year-old soldier wounded during the Spanish war in the right hypogastric and lumbar regions. Laparotomy revealed an injury of the liver and the kidney and hematomas of the gall bladder. Of particular interest was an anomaly of the biliary tract. The right hepatic duct, as found to enter the cystic duct at the neck of the gall bladder, and the left hepatic duct joined the cystic duct little lower to form the common bile duct. Because of the fact that it was necessary to move the patient to another hospital, the author found it impossible to follow his course.

A presentation of the various types of congenital anomalies of the biliary tract is made on the basis of a review of the literature. These anomalies are illustrated. The author states that Schnachner classified anomalies of the gall bladder according to location and gross appearance. Several observers have reported complete absence of the gall bladder, and Phillips described a very small gall bladder which resembled the appendix in appearance.

The most common congenital anomaly of the biliary tract is the lateral implantation of the cystic duct in the neck of the gall bladder so that a diverticulum is formed at the lower end of the ampulla. Other relatively frequent anomalies are cases in which the cystic duct joins the hepatic duct at an acute angle after running parallel with it, and cases in which the cystic duct assumes an anterior or posterior spiral course to the hepatic duct entering the latter either laterally, medially, or posteriorly.

An unusual anomaly was described by Starlinger, who observed a case in which there was a bifurcation of the cystic duct and a congenital obliteration of the hepatic duct. Other anomalies have been described consisting of accessory hepatic ducts entering directly into the gall bladder or into the cystic duct.

The author quotes Kehr, who has described three types of anomalies of the biliary duct: (1) the type in which the right and left branches of the hepatic duct are united into the normal bile duct but in which two accessory ducts join the gall bladder, (2) the type in which the right hepatic duct enters the gall bladder as two branches and the left hepatic duct enters the normal common bile duct, and (3) the type in which the right and left hepatic ducts enter directly into the gall bladder and the cystic duct continues as the common bile duct. A relatively rare anomaly consists of double duodenal openings of the common duct.

The author states that Darog described a case in which there was the unusual anomaly of the right hepatic duct entering directly into the duodenum. Delmon and Demarez described a case in which the cystic duct joined the common bile duct about 1 cm from the ampulla of Vater. Leotta described an anomaly which is characterized by the hepatic ducts flowing into the neck of the gall bladder and the cystic duct being continued as the common bile duct. Reference is made to other unusual anomalies that have been described. MICHAEL DELBANY, M.D.

Soupaoui, M. R. Therapeutic Results in Anastomoses Between the Biliary and Intestinal Tracts (Les résultats thérapeutiques des anastomoses bilio digestives). *J. de chir.*, 1940, 35: 289.

Anastomoses between the biliary and intestinal tracts overcome biliary obstruction without external loss of bile.

In the case of malignant tumors of the pancreas, papilla of Vater or bile ducts, the average life expectancy is from six to nine months, and the operative mortality from 40 to 50 per cent. In spite of this the anastomoses are justifiable because of

the relief from suffering afforded and because of the chance of a wrong diagnosis.

Congenital dilatation of the bile ducts is rare, causes unremitting obstruction, and occurs in young, good-risk patients. The authors prefer the choledochoduodenostomy in these cases. The results are uniformly good in spite of the fact that much reflux of intestinal contents through the stoma must occur. In two thirds of the cases the bile duct remains patent, but this does not detract from the efficacy of the operation.

Traumatic (operative) lesions of the bile passages are of various types. Gall-bladder fistulas, when due to obstruction of the cystic duct, are cured by cholecystectomy, and when due to obstruction of the common duct, by cholecystenterostomy. Fistulas of the common duct are cured by choledochenterostomy in 52 per cent of the cases. Most successful results are obtained when the fistula has been functioning well pre-operatively. The complication most to be feared is not ascending infection but scar contracture of the stoma.

Cholelithiasis, cholangitis, and biliary dyssynergia are treated as one group. When the common and hepatic ducts are principally affected a biliary-intestinal anastomosis, and not prolonged external drainage, is indicated. Primary side to side choledochoduodenostomy is indicated in all cases of lithiasis of the common duct with cholangitis or when it is believed that the obstruction has not been entirely relieved by the operation. The mortality is 10 per cent and good results are to be expected in 80 per cent. In spite of the realization that the intestinal reflux often pockets in the lower end of the common duct and that the operation represents an irretraceable step, the authors consider that primary choledochoduodenostomy should occupy a prominent place beside external drainage. Secondary choledochoduodenostomy is used after failure of previous surgery of the common duct. It should not be used until after complete investigation and attempts at cure by medical means (cholangiography, attempts at dissolving stones, cholagogues, and duodenal drainage) have been carried out. Good functional results occur in 55.5 per cent, poor results in 25 per cent.

When chronic pancreatitis causes biliary obstruction it may be treated by internal drainage by biliary-intestinal anastomoses. Cholecystenterostomy for this condition produced cures in 60 per cent of the cases and external drainage in 80 per cent, but biliary-intestinal anastomoses secondary to external drainage for chronic pancreatitis produced cures in 100 per cent. In cases of hepatitis external biliary drainage is sometimes indicated, and cholecystogastrostomy may be used in cases of gall bladder stasis. Biliary-intestinal anastomoses are never indicated in cases of gastric ulcer although this has been advocated by some authors.

The author wishes to emphasize that anastomosis between the biliary and intestinal tracts should have a wider application. RICHARD WARE, M.D.

Soupeault, R., and Mallet-Guy P: The Technique of Choledochoduodenostomy (*Technique de la cholédoco-duodénoostomie*) *J de chir* 940, 55 3 3.

Soupeault and Mallet-Guy note that the indications for choledochoduodenostomy may be absolute or relative. Relative indications occur more frequently and are present under more favorable conditions than absolute indications. When in cases of obstruction of the common duct the surgeon has a choice between external drainage and choledochoduodenostomy the latter operation should be done only when the common duct is dilated and its walls are sufficiently thick for the placing of sutures in two or three planes, and when the duodenum can be well mobilized. Under such circumstances and if the incision is sufficiently large, the operation can be done successfully even in very obese patients.

The pre-operative care of the patient is important. These patients are often jaundiced, dehydrated, and anemic and there is hepatic insufficiency often associated with renal insufficiency. In addition to the usual pre-operative measures, isotonic glucose solution should be given intravenously and the excess blood sugar balanced by insulin. The blood should be carefully examined, especially with regard to bleeding and coagulation time. Retraction of the clot, and the blood count. Small blood transfusions should be given, and calcium, preferably calcium gluconate, should be administered by intravenous or intra muscular injection.

In operating on patients with obstruction of the common duct, regional anesthesia should be employed both inhalation anesthesia and high spinal anesthesia involve definite risks to the patient. Regional anesthesia includes gradual infiltration of the abdominal wall and infiltration of the splanchnic nerve in the celiac region. For splanchnic infiltration a sufficient amount of the anesthetic, from 60 to 70 c.c.m. must be used, usually 1/100 solution. In combination with the amount of anesthetic used for infiltration of the abdominal wall, the total amount of novocaine should not exceed 5 gm. For pre-operative sedation, barbiturates and scopolamine should be avoided, morphine should be given in divided doses during the two hours before operation. With some patients much less anesthetic is needed this is true particularly of jaundiced patients with hepatic insufficiency.

A long vertical incision in the median line gives the best exposure for choledochoduodenostomy. After the field is well exposed, thorough exploration of the biliary tract must be made before the operation is done.

Various techniques are employed for the anastomosis of the common duct with the duodenum. In Flinsterer technique the incision of the common duct is made parallel to its axis from the point of entrance of the cystic duct to the duodenum this incision is made little to the right of the median line. The incision in the duodenum begins at the termination of the choledochus and is carried toward

the right along the upper border of the duodenum. A side to side anastomosis is made in two planes, the sutures being covered by omentum.

In the operation of Juraux, the anastomosis is made behind the duodenum on its posterior surface. This technique brings the anastomosis closer to the papilla, and the excluded segment of the common duct is reduced to a minimum, but it requires more extensive exposure of the duodenum.

The technique of Floercken is very similar to the preceding technique, but the exposure of the duodenum is not so extensive and the duodenal incision is transverse, although the incision of the common duct is vertical.

Whatever technique is used, curved needle is used for placing the sutures, and non absorbable suture material (such as silk) is preferable. Interrupted sutures are employed.

Postoperative care includes drop by drop infusion of glucose solution (10% the injection of 500 ml of 5% solution per liter in divided doses). Calcium in large doses and blood transfusion are indicated if there is any tendency toward hemorrhage. As rule patients rally very quickly from the operation under this treatment and recovery may be complete in three weeks.

The authors report cases of obstruction of the biliary tract in which choledochoduodenostomy does more than as only postoperative death due to renal failure and uremia. One patient died 1 year after operation of progressive cachexia (obstruction apparently due to cancer of the pancreas) the other patients are living and are for the most part entirely free from biliary symptoms.

ALICE M. MERRICK.

Roth, P. P. The External Choledochoduodenostomy: Its Immediate and Late Results in Cases in Which the Indication is Only Relative (The Choledochoduodenostomia externa, ihre Nach- und Fernergebnisse bei relativer Indikation) *Monatsschrift für die Klein Chirurgie*, 1930.

The opinions concerning the operative procedure in calculous diseases of the choledochus and hepatic ducts, in stenosis of the biliary passages resulting either from trauma or inflammation, and cholangitis are still in great variance. The old method as employed by Kehr of drainage by means of the T-tube is today the least used, because the continuous loss of bile leads to digestive disturbances due to insufficient fat absorption, to increased bone fragility and to cholemic hemorrhages. This method is only exceptionally considered of value in cases in which an extremely fragile choledochus in cases in which the choledochus is deeply situated in obese patients, and in cases of sacral infestation of the biliary passages. The dilatation of the sphincter of Oddi, a recommendation by Hofmeister, has also been abandoned. The absolute indication for choledochoduodenostomy is closure of the papilla of Vater resulting from inflammatory or neoplastic tumors. The relative indication applies to all other diseases especially since the

SURGERY OF THE ABDOMEN

absolute freedom from danger of this procedure has been demonstrated by the experiments of Alessandri. In the latter category belong calculous conditions, scar like stenosing processes in the biliary passages, especially those following previous operations, suppurative cholangitis with the accumulation of concretions, and idiopathic cysts of the choledochus.

We must differentiate between choledochoduodenostomy externa and interna. In the latter the choledochus is exposed through the duodenum. However, in this procedure, because of the manifold manner of the anatomical insertion of the choledochus, there is danger of injury to the pancreas. This procedure is technically difficult and has the high mortality of 19 per cent. Sasse has systematically developed the external choledochoduodenostomy. He still used the retroduodenal portion of the choledochus, to day the supraduodenal method is employed as the method of choice.

The technique of the Floerken clinic follows.

The gall bladder is removed, and the choledochus is probed by passing a sound through the stump of the cystic duct. An incision about 1 or 2 cm in length is made into the common duct between two guy sutures so that the duct can be employed for the subsequent anastomosis. The incision is made in a longitudinal direction, above the opening of the common duct into the duodenum. The hile which gushes out is suctioned off by means of a water pump. The patency of the choledochus is determined either by the passage of a sound, or by means of the Payr-injection method with normal salt solution. Stones are removed with the gall stone forceps. Mobilization of the duodenum is not necessary. On the upper margin of the duodenum, in its longitudinal direction, an incision is made perpendicular to the choledochostomy incision. This is followed by suturing of the serosa with silk, and suturing of the other layers with catgut. A hit of omentum and the serosa of the hepatoduodenal ligament serve for the purpose of covering the line of suture. The wound is always packed and drainage is instituted.

Among the 113 cases a temporary flow of hile occurred, in 21 instances because the anastomosis did not hold firmly, a proof of how necessary drainage is in these cases. A permanent fistula never occurred.

The author then combats the arguments which have been made against choledochoduodenostomy.

- 1 The retrograde filling of the extrahepatic and intrahepatic hiliary passages with harum indicates the danger of a retrograde passage of food with subsequent cholangitis. This roentgenological filling does not occur while the patient is in a standing position, but only when the patient is placed on his right side and in the Trendelenburg position. However, the specific weight of the duodenal content is ever, the specific weight of the bile, and at any rate is lighter equal to that of the bile, and at any rate is lighter than the barium mixture. Furthermore, it has been shown that it is particularly a wide anastomosis which protects against cholangitis much more readily than a narrow one.

- 2 The second argument is that a retroduodenal sac develops, in which fruit seeds and fruit skins may build ideal crystallization foci. It is for this reason that in this clinic the incision is always placed 1 or 2 cm above the opening into the duodenum and in this manner only the smallest possible blind sac may be formed. As an exception to the rule, the author, however, does present a case in which the duodenal content found its way into the extrahepatic and intrahepatic hiliary passages. In this case tomato skins became encrusted and the condition had led to the formation of a large retroperitoneal abscess in the right psoas muscle, this abscess had recently broken through into the inferior portion of the duodenum. Since then the patient has remained completely well for a period of fifteen years and has never during this time had any complaints or jaundice.

- 3 The third argument is that the anastomosis may become obliterated, as is evidenced by certain cases of Sasse and Finsterer. The anastomosis, however, can be obliterated only if the sphincter of Oddi again becomes capable of functioning and the papilla again becomes patent. Undoubtedly many recurrent complaints may be attributed to this complication. The wider the anastomosis, the more does one protect against the occurrence of obliteration.

All of these arguments, however, can be minimized by the usual good results. In the first place this operation is recommended because of the light operative mortality. In a statistical study Floerken determined this to be 10 per cent. In his clinic only 6 (5.3 per cent) of 116 patients died immediately following the operation. In all of these cases, he was dealing with extremely weakened patients (2 died of circulatory failure, 2 of bile peritonitis, 1 because of insufficiency of the suture line, and 1 following insular secondary hemorrhage). Otherwise the immediate results were extremely satisfactory. Jaundice disappeared after only a few days. The attacks of colic ceased and the patients were able to eat a mixed diet. In many instances, however, it was noted that at first mild attacks of colic and slight jaundice still occurred, no doubt because the anastomosis assumes its function only in a gradual manner.

Seventy-five patients were studied in a follow up examination, but only those upon whom the operation had been performed at least two years previously were considered. Among these were 27 who had been operated upon more than fifteen years previously, 18 more than ten years previously, 16 more than five years previously, and 7 who had been operated upon more than two years previously. Seventy of the patients had never had any complaints at all following operation. Only 5 patients had to keep to a special diet, 4 had incisional hernias which were well retained by belts. On the average, the patient's stay in the hospital was about twenty-five days, so short a period, as compared to the length of hospitalization necessary when the hepatic ducts are drained, that it also must be taken into consideration.

HARRY A. SALZMANN, M.D.

Warren, R., and Baish, F. G. J. Carcinoma of the Gall Bladder. *Surgery* 9:40, 7, 637.

Although carcinoma of the gall bladder may occasionally develop in the presence of gall stones, the great majority of cases are associated with gall stones which precede the development of the tumor. It is impossible to determine accurately the exact percentage of cases of gall stones that develop carcinoma of the gall bladder but it probably lies between 1 and 5 per cent. As clinical criteria have been established to tell which cases of gall stones will develop carcinoma of the gall bladder.

Although carcinoma of the gall bladder is practically incurable once the diagnosis is established clinically the risk of carcinoma developing in any case of gall stones is so small as not to indicate prophylactic cholecystectomy for that reason alone. The decision as to the advisability of cholecystectomy in cases of gall stones with few or no symptoms should be governed by consideration of the danger of non-malignant complications rather than by the risk of carcinoma of the gall bladder. JOSEPH K. NARAYAN, M.D.

MISCELLANEOUS

Matthaeus, G. The Treatment of General Bacterial Peritonitis. A Study (Die Behandlung der all gemeinen, freien, bakteriellen Bauchfellentzündung. Eine Studie) *Ergeb. d. Chir.* 9:39, 3, 96.

After a general review of the German literature on the subject of general bacterial peritonitis, the author goes into the anatomy of the abdominal cavity, the physiology of the peritoneum (reabsorption, exudation, plasticity) and the nature of bacterial peritonitis. Matthaeus states that the fundamental aim in the operative handling of peritonitis is the elimination of the infection as completely as possible. The necessity for rapid and strenuous surgery is also emphasized. In perforated peptic ulcer the opening should be closed and gastroenterostomy or resection deferred. The gall bladder is removed only in early cases, and in others drainage is instituted. Early operation in peritonitis is generally approved, apparently because of the more favorable end results. In contrast to this it must be noted that the late operative mortality is very high. Matthaeus tends to follow routine of handling all cases of peritonitis seen within forty-eight hours regardless of the condition, age or constitution of the patient, and does not advocate individualization of the cases. In peritonitis originating by means of the lymphogenous or hematogenous routes, such as pneumococcus and streptococcus peritonitis, surgical elimination of the infection is impossible. Pneumococcus peritonitis is primarily a disease of children and because of the richness of the fibinous exudate there is a tendency toward encapsulation. Therefore expectant treatment seems proper in these cases. The prognosis depends upon the severity of the infection and the resistance of the peritoneum rather than upon any type of incomplete operation. Encapsulated abscesses should be drained. On the

other hand, streptococcus peritonitis shows little tendency to become sealed off. The usual violence of this organism makes the prognosis much more unfavorable. Infections entering through the female genital organs, especially gonococcal, are generally benign and healing occurs without the aid of surgical measures. Matthaeus states that the intraperitoneal instillation of Behring's peritoneal serum through a small catheter after primary closure of the abdomen is a prophylactic measure of some value. It may be used in cases such as those subjected to omentectomy for tumor in which some degree of peritonitis is anticipated. The serum is not indicated in aseptic operations because it has not been shown that the serum will protect the peritoneum against infection in every case. Matthaeus finds no marked difference between the mortality rates when the exudate has been removed by sponging or by irrigation. Both methods have their advantages and disadvantages. Early removal of exudate should be avoided. When marked mottling is present, as in perforated peptic ulcer irrigation is preferred. Irrigation works mechanically. Whereas in cases with a rich exudate and a great deal of pus, as in generalized peritonitis, it is better to avoid irrigation in fibrinous peritonitis forms irrigation is indicated. Encapsulated peritonitis is sponged out.

As regards anti-bacterial therapy the author differentiates the chemical and biological antiseptics from those agents which inhibit reabsorption and those that stimulate the formation of exudate. Matthaeus does not find the chemical substances such as iodoform, alcohol, colloidal silver, and ether of much value. It is impossible to disinfect the abdominal cavity. The situation is somewhat different with biological antiseptics. Substances which the body uses to protect against infections, such as 2.0 hydrochloric acid, or hydrochloric acid peptone are employed. With or without the presence of peptone the acid is quickly neutralized in the abdomen; therefore the action on bacteria must be very short. The old method, with camphor oil, has been discarded. Absorption of toxic substances by the peritoneum is the threatened danger; this occurs by way of the blood system. Irrigation with hypertonic solutions such as 50 to 80 per cent sugar solution or 10 per cent sodium chloride is possible only if continuous flow of secretions to the outside is present. The peritoneal cavity can be drained for only a short time, and, in addition, this type of treatment upsets the entire balance of the entire body.

The author differentiates between tamponade and drainage. The gauze placed in the wound rapidly absorbs everything to the fullest extent because of capillary attraction and thereafter acts as a plug. This results in stagnation of the exudate which may lead to marked bacterial proliferation. Tamponade works satisfactorily because of the adherence to structures. When extensive infection is present and aids in packing a very edematous necrotic part. Drainage in the free peritoneal cavity is indicated.

only in late cases. When the exudate is rich and there is marked agglutination of the loops of bowel drainage is possible for only a short time. The Rehn-Lowder position does not seem to influence the end results. So-called local drainage is to be differentiated from drainage of the free peritoneal cavity. Primary closure of the abdomen in peritonitis due to appendicitis seems to be a good principle, but its generalization must not be too great. Matthies is of the opinion that primary and secondary types of infection are eliminated by the peritoneum. Various types of serum (Hehring's peritonitis serum, colon and perfringens antitoxin) may be used intraperitoneally, intravenously or intramuscularly with good results. It has not been definitely proved that these results are due to the disappearance of the peritonitis. One must bear in mind the danger of anaphylaxis.

In closing Matthies discusses briefly the postoperative treatment as regards circulation, peristalsis, vomiting, hiccoughs and thirst. He stresses the importance of prophylaxis against peritonitis. Early recognition of peritonitis is essential. One must appreciate the two opposing factors of infection and individual resistance. All possible means must be taken not to disturb or destroy the natural biological resistance for the outcome depends largely on the ability of the individual to wall off the infection. (GUTH: JOHN A. GUTH, M.D.)

Lehman, E. P., and Boyd, E. The Prevention of Peritoneal Adhesions with Heparin. An Experimental Study. *Ann Surg*, 1940 111: 47.

(To replace previous abstract on pp. 39 and 40 of this volume.)

In two sets of experiment with corresponding controls heparin was found by the authors to be astonishingly effective in preventing adhesions when introduced into the peritoneal cavity of the dog and rabbit. The number of experiments is limited and the work has not progressed sufficiently to warrant application to the patient. If the experimental value of heparin in preventing adhesions is confirmed by other investigators, its use will offer considerable promise for this heretofore essentially unsolved problem.

The permanent fibrotic peritoneal adhesion is the final result of organization of a fibrinous inflammatory exudate between two apposed injured peritoneal surfaces. At first the exudate is serous or seropurulent and unclotted, but it soon becomes coagulated and a fibrinous adhesion is formed. Once the apposing mesothelial layers are destroyed in this zone, the exposed subperitoneal connective tissue and blood vessel elements are stimulated to proliferate over the fibrin scaffolding. The organizing process eventually replaces the fibrinous adhesion and a permanent fibrotic adhesion remains. Since heparin has been found by other investigators to prevent thrombosis, it seemed logical to the authors to believe that heparin might also be used effectively in preventing the coagulation of the inflammatory

peritoneal exudate and thus preclude adhesion formation. The heparin anti-adhesion attack is concerned with preventing fibrin formation and not with its removal once formed. These preliminary animal experiments were conducted to test this hypothesis.

In 68 rabbit experiments adhesions were produced by two methods: mechanical damage and bacterial contamination to the peritoneum. The mechanical peritoneal injury was effected by a modification of Donaldson's pledget technique while the peritoneal contamination was produced by perforating the appendix and expiring a small measured quantity on adjacent serosal surface. In the latter method the appendix was always emptied and the perforation was not closed. When the two types of peritoneal damage had been surgically produced, a control group (no solution, normal saline and isotonic fluid) and an experimental group (heparin) were established. Equal amounts of the respective solutions were then introduced intraperitoneally before closure at this operation. The injections were repeated by paracentesis on the ensuing two postoperative days. The results indicate a striking difference in the number of formed adhesions between the control and experimental groups. In the mechanical trauma experiments (36 animals) all of the different 26 control animals showed adhesion formation, but only 1 of 10 of the heparin treated animals presented any adhesions. In the contamination experiments (32 animals), the results were similar. All of the 10 controls showed adhesion formation while none of the heparin treated animals produced adhesions.

In 40 dog experiments, designed to recreate the frequent surgical problem presented by adhesions needing division on account of intestinal obstruction, the results suggest that heparin is quite effective in preventing adhesion reformation. Adhesions caused by peritoneal contamination were produced exactly as in the rabbit experiments but approximately half of the dogs died from peritonitis following this procedure. Six weeks later, at a second laparotomy, the formed adhesions were counted and divided. At the same time control and experimental groups were established as in the rabbit experiments described, and equal amounts of the respective solutions were introduced into the peritoneal cavity before closure. The injections were also repeated by paracentesis on the first and second postoperative days. Two weeks later the reformation of adhesions was observed at a final laparotomy. In all of the control groups a greater number of adhesions reformed than were divided. The average number of formed adhesions in the combined control groups before division was 8, while the average number of reformed adhesions was 12.6. This makes a reformation rate of 157 per cent for the control animals as a group. In contrast, the heparin treated animals presented only about one quarter as many reformed adhesions. The average number of formed adhesions in the experimental group before division

was 0.7 while the average number of reformed adhesions was 2.6. The re-formation rate here, then, is 36 per cent. This numerical difference is less striking than the difference observed in celiotomy in which it was seen that the adhesions following the introduction of heparin were uniformly single strands, whereas those in the controls were usually broad bands and beets.

The chief danger in the employment of heparin seems to lie in the occurrence of hemorrhage. Three dogs of the 4 receiving heparin suffered massive intraperitoneal hemorrhages all fatal. Heparin prevents the formation of fibrin but does not dissolve or destroy it. It is logical, therefore to assume that

hemorrhage should not be a danger in the intra-peritoneal use of heparin provided complete hemostasis is assured before closure of the abdomen. It is assumed that in the 3 hemorrhages here reported, all of which occurred early in the study this eventuality was not observed. A wider animal experience is believed necessary before the method can be considered for this reason.

If heparin is found useful against the formation of adhesions in the peritoneal cavity it is conceivable that it may also be employed effectively in other serous cavities such as the pleural cavity, the pericardial sac, the subarachnoid space and the various joints.

GYNECOLOGY

UTERUS

Savignoni, F. Hysterosalpingography in Sterility (L'hysterosalpingografia nella sterilità) *Clin ostet*, 1940, 42 101

The first attempts at hysterosalpingography were made in 1914 when Cary injected collargol and Kennedy used 40 per cent sodium bromide. The author briefly sketches the Italian contributions in this field since then. He describes the manometers and methods of injection used with suitable pictorial illustrations. By such means motor activity may be demonstrated in the tubes. This activity is (a) splintetric, (b) peristaltic and anti peristaltic, and (c) pendular.

The author studied 100 sterile women by means of hysterosalpingography. The husband was examined for sterility in each case. In no case was the procedure carried out when there was evidence of active inflammation or cervicitis. The most favorable time to do hysterosalpingography is between the ninth and fifteenth days of the intermenstrual period.

In his description of the technique the author notes that he never exceeds a pressure of from 200 to 250 mm of mercury in performing the injection. He finds that the failure of complete passage of the oily medium through the tubes at the first trial is no proof of tubal obstruction. He records cases in which the second attempt was successful. In real obstruction of the tubes the medium does not enter the abdominal cavity. A frequent finding in these sterile women was a tortuous course of the tubes (Fig 1). Such a condition is an obstacle to the meeting of the spermatozoa and the ovum. A frequent finding in these women was a congenital distortion in the position of the uterus (Fig 2).

The procedure of hysterosalpingography has had a curative effect on the sterility of some women



Fig 2

with mild tubal obstructions. Congenital deformities were demonstrated in some. This method is particularly suitable for demonstrating congenital anomalies and deformities in the development of the genital tract. It is also suitable in diagnosing disturbances of position and after-effects of inflammation in the genital apparatus. Numerous illustrations are presented. Jacob E Klein, M D

Goodall, J R. Endometrioma Interstitiale Preliminary Report *J Obst & Gynaec Brit Emp*, 1940, 47 13

Interstitial endometrioma is a disease in which the interstitial cells of the endometrium have taken on invasive and vicarious growth beyond the normal bounds of the endometrium. The author notes that sarcoma of the uterus is a very rare disease. Older cases, some reported herewith, first diagnosed as sarcoma, and later re studied by the author, were found to fall into the non malignant and curable type of interstitial endometriomas. Two distinct clinical types of the disease appear. In one there is a uniform symmetrical enlargement of the uterus, even to the size of a three months' pregnancy, due entirely to thickened walls from new growth infiltration and concomitant stimulation of associated fibrous and muscular tissues. The endometrium may be normal or greatly thickened. In the second clinical type there is a definite tumor formation of the uterus with the gross characteristics of a fibroid. This may be multiple. In the same instances, large cysts containing clear, straw colored fluid were found within the larger nodules. In 5 of the 14 cases described by the author, an extra uterine endometriosis was also found at operation. It is assumed that there is a common cause of the two conditions.

In this monograph the author presents in detail studies of interstitial endometrioma as found in 5 patients. He concludes that interstitial endome-



Fig 1

trionia is disease *i gowris* and that it is of very common occurrence. It may be acute, stimulating a sarcoma or may be so chronic that it resemble richly cellular fibroids. It may be diffuse involving all the walls of the uterus, or specifically affect only one part when diffuse and chronic, it closely simulates chroid fibroids.

The author concludes that von Recklinghausen's disease (adenomyoma) is not congenital but an acquired disease similar in every respect to a local interstitial endometrioma, but with the added differentiation of the occurrence of some of the endometrial cells in associated glands. The active agent, estrin, in the production of an interstitial endometrioma, usually stimulates other structures of the secondary sex organs into growth activity and the provocative agent is probably the unrestrained growth hormone estrin. The removal of the ovaries or their functional destruction with radium or the x-rays removes the source and since nature is constantly endeavoring to restore the normal balance spontaneous regressions and recoveries are fairly common. The growth hormone when in excess is an inhibitor of pregnancy for although the fallopian tubes are commonly patent in endometriosis and endometriomas, pregnancy rarely supervenes.

HAROLD F. THURGOOD, M.D.

ADNEAL AND PERIUTERINE CONDITIONS

Kaschler R. Chorio-Epithelioma of the Tube. Report of New Case (Das Chorioepitheliom der Tube. Bericht über einen neuen Fall) *Zentralbl. f. Gynäk.* 1939, p. 377.

Fifty-four cases of chorio-epithelioma of the tube have been reported in the literature. A new case is added. A forty-year-old para vi with a history of regular menses came to the clinic reporting bleeding of 1 and one-half weeks duration beginning ten days after her last period. On examination, normal uterus was found and a thickening of the right adnexa. A tubal pregnancy did not seem probable since the usual symptoms were lacking. The patient as released after the administration of secal and hormone from the posterior lobe of the pituitary gland. She as told to return in a week. After about six weeks she returned with the information that after cessation of the bleeding for four and one-half weeks, heavy bleeding had recurred. On the right side and behind the unchanged uterus a solid tumor was palpated. It was the size of man's fist slightly mobile and inflammatory.

Since no improvement as obtained with conservative management, the tumor had increased in the size of child's head, and the patient had become febrile laparotomy as performed. The tumor was removed together with the tube which had grown to the size of hen's egg.

Macroscopically the tumor resembled chorio-epithelioma in its spongy soft consistency and gray red color. Sixteen days after the operation the Schenk-Zondek test negative. A second test

four days later with concentrated urine and also with urine of a dilution of 1:200 gave positive test. On the twenty-fifth postoperative day the patient died with cardiac complications.

A toxy blood met. stains in the lung and in the bed of the removed tube and ovary. The greater portion of the tube removed at operation was that of the distended tube which was filled with brown rhagic and chorio-epitheliomatous tissue.

A detailed, critical comparison of the observed cases with the present case as made the details of which should be read in the original.

(W. REICHENBERG) ROYAL R. GREEN, M.D.

EXTERNAL ORBITALIA

Falsom C. E. Tumors of the Vulva. *J. Am. W. Ass.* 1939, 14: 499.

The author's experience points to the fact that a better general understanding of benign tumors of the vulva is an important part of preventing gynecology and is therefore essential in the proper insight and control of vulvar cancer. The greatest error in the management of these lesions is the inadequate emphasis on the metaplasia and malignant change in apparently benign vulvar tumors. Papillomas, sebaceous cysts, pigmented moles, leiomyofibromas, vulva breast tissue, and sweat gland adenomas are some of the benign lesions which may at a later period in a woman's life degenerate into vulvar malignancy.

The characterization of these tumors are discussed and the author then points out the malignant changes found in the cases of vulvar tumors of some standing prior to their admission to the hospital.

While sarcoma of the vulva is rare, its evolution is usually rapid. It may develop in the vulvar end of the round ligament or may be primary in the vulva. This lesion is usually irregularly modulated, and covered with thin layer of epidermis. It may resemble fibroma of the vulva until ulceration has taken place. In the sarcomas reported upon by the author the inguinal glands were involved in all cases, which finding was in contrast to the findings of Frank who stated that these glands are rarely affected. In spite of the tenet of some pathologists that fibrosarcomas tend to remain localized, the author stresses that these tumors may usually undergo wide hematogenous spread.

Metastatic malignant tumors of the vulva are rare, as are basal-cell carcinomas. They appear as small indurated and ulcerated tumescences usually found on the labia majora.

Carcinoma of the vulva is the most common malignant neoplasm of the external female genital. Vulvar cancer is primarily tumor of senility with the greatest incidence during the sixth and seventh decades. The symptoms are characterized as carcinomas of the vulva are pruritus, tenderness, soreness or actual pain, and spotting or irritative leucorrhoeal discharge, and if one waits for these cardinal symptoms to appear before making the

diagnosis, there is little hope for a favorable prognosis.

The author believes that the treatment of vulvar cancer is becoming more rational in the light of present anatomicopathological knowledge of these lesions. Surgery of the vulva, combined with resection of the superficial and deep inguinal lymph glands, the so called Basset technique with modifications by Taussig, continues to be the best treatment for carcinoma of the vulva. ANTHONY F SAVA, M D

MISCELLANEOUS

Krels, J. The Concealed Cycle and the Functional Cycle in Women (Cycle inapparent et cycle fonctionnel chez la femme) *Rev franç de gynéc et d'obst*, 1940, 35, 3

This article is a mathematical discussion of the menstrual cycle. The author wishes to show that although women have a perfectly obvious menstrual cycle of 28 days, there is a definite time relationship connected with every interruption of menstruation. Thus, if an amenorrhea develops, for one reason or another, the reappearance of menstruation has a definite time relationship to the last period. There is a common factor of 7 days. The usual cycle is 28 days, that is, 4×7 . There are other cycles of 21 days, that is, 3×7 , and lesser known cycles of 35 days, or 5×7 . He points out that the usual period of gestation is 280 days, or 40×7 . In certain cases of amenorrhea he has found it necessary to do a curettage and has found that the uterine mucosa was in a phase that corresponded to that to be expected if the patient had continued to menstruate.

When labor is apparently delayed beyond the expected date, it occurs generally 7, 14, 21, or 28 days later. The return of menstruation after labor has a very definite relation to the date of confinement or to the cessation of lactation. And here again the time interval is a certain number of days. As a rule the patient's usual rhythm carries through labor and lactation so that menstruation reappears on a day that could be calculated from her last period. However, there are some patients in whom the confinement would seem to set a new rhythm so that the menstrual cycle starts from this point. In many women, the return of the periods following labor occurs in 6 weeks, that is, 6 multiplied by 7. Occasionally periods return 7 weeks after confinement. The author was struck by the conspicuousness of the 7 factor.

In conclusion, it may be stated that there are certain definite factors in the re-establishment of menstruation following any interruption of it, and it will be found that this re-establishment occurs some time after the last regular period that is divisible by 7. ADRIEN VERBRUGGHE, M D

Reynolds, S R M. Gynecic Physiology and the Gynecologist. *Am J Surg*, 1940, 48, 175

This is a review of the number, nature, and interrelationships of the gonadotropic and sex hormones, with a consideration of their effects.

The gonadotropic hormones are those which are capable of inducing directly characteristic changes, of a stimulating nature, in the gonads of suitable experimental animals. Today, the gonadotropes are held to be (a) of anterior pituitary origin, (b) of chorionic origin, and (c) those typical of pregnant mare's serum, the active principles of which probably arise from the placenta.

None of the gonadotropes has been isolated in purified form. Despite this fact, extracts are now commercially available, which are said to be predominantly "follicle stimulating" or "luteinizing." Their true effects on the human ovary may not be accurately stated at the present time. Hence, their use at this time is empirical and should be recognized as such in the evaluation of successes and of failures.

The gonadotrope, prolactin, or the chorionic gonadotropic hormone is associated with human pregnancy, or neoplasms arising out of pregnancy. It has not been shown to be capable, when acting alone, of inducing luteinization in monkeys or women, and in those forms in which it does induce luteinization most readily, the placenta does not elaborate appreciable or even measurable amounts of such a hormone.

The relation of equine gonadotropes to prolactin and anterior pituitary gonadotropes remains to be established. Some reports have indicated that ovulation may be induced in women by equine gonadotropes, although the published results to date are equivocal.

Little may be said at this time regarding the ultimate value of gonadotropic substances in endocrine therapeutics. The most important aspect of current work lies in what is known of their presence in the blood and urine under normal and abnormal circumstances as a diagnostic aid. Their significance in the early determination of pregnancy (Aschheim-Zondek and Friedman tests), in the early establishment of ectopic pregnancy, and the detection of chorionic epithelioma are cases in point.

In the absence of pregnancy, the detection of gonadotropes in the blood and urine requires special concentration (extraction) of the hormones. In normally menstruating women it appears that a gonadotropic substance may be obtained in the midcycle. More important is the fact that it is far more abundant in urine obtained during afunctional conditions (operative castration, radiation castration, postmenopause, amenorrhea of long standing) as well as in certain hyperhormonal conditions (climacteric, irregular menses, polymenorrhea). According to Fluhmann, it is seldom found in hypohormonal cases (irregular menses, scanty menses, amenorrhea of short duration).

The number of native sex hormones is now known to be few, and these lend themselves to grouping into (a) gynecogenic substances comprising both estrogens and progestogens, and (b) androgenic substances. The structural formulas of these and other important related substances are now known.

An *estrogen* may be defined as a substance derived from natural, artificial, or synthetic sources, which

brings about in immature, ovariectomized, or senile female animals growth of the accessory sexual glands (tertiary, tubal, vaginal, and breasts) to normal (maternal) or supernormal size. They are called estrogens because they are capable of producing changes which simulate the specific histological and functional changes characteristic of estrus in certain laboratory animals.

A *progestogen* is a substance which, acting upon uterus first stimulated by an estrogen, causes further growth, marked glycogen deposition, secretion of the uterine glands, and hyperplasia of the glandular epithelium and of the muscular elements of the myometrium. These changes are necessary for implantation and the maintenance of gestation, whence comes the name *progestin* devised by Corner and Allen.

An *androgen* is a substance which, when injected into immature or castrated male animal, elicits extensive growth of the seminal vesicles, spermatic cord, prostate gland, penis, and Cowper's and the preputial glands.

The important facts concerning the relative potencies of various estrogens are not so well known. The several primary estrogens are almost without exception, *qualitatively* identical in their effects, yet striking *quantitative* differences between them have been clearly established. Such differences are clinically important because they affect not only the time of onset of a given response but also the amount of hormone and the duration of the response which a given mass of hormone will elicit. The latter is important since it governs the frequency with which the hormone must be administered.

The relative effectiveness of a number of estrogens by the uterine growth test reveals the following series in decreasing order of effectiveness per unit mass of hormone: estradiol, estradiol benzoate, estrone, equillin, equilenin, estron benzoate, estriol. The order of this series is not basically important, however, because estriol, last in the series, is the most potent estrogen when taken by mouth.

Determination of the threshold dose of estradiol, estradiol benzoate and estradiol dipropionate for the induction of estrus shows that estradiol is about twice as effective (by mass) as either of the other substances. If however one considers the *duration* of the estrus induced by the same threshold mass of each hormone, the dipropionate ester is many times more effective than estradiol, while the benzoate ester is intermediate in this respect.

The foregoing considerations show clearly the futility of attempting to gauge the relative potency of several estrogens on the basis of one phase of a twofold response, threshold and duration. It is also unfortunate that many of the estrogens are not expressed in the same units—there is great confusion when one attempts to compare dosages.

The clinician may well ask, but he is not to obtain the greatest effectiveness from a given dose, when the label on the box gives no true indication of the relative potency of its contents. The entire question of standardization should be reopened by

the proper authorities, and a true basis for comparison agreed upon. In the meantime the physician would do well to adopt some one type of estrogen in his practice, learns by experience how much and how frequently it must be given to obtain desired effect. In general esterification prolongs the action of an estrogen, while reducing its threshold for the induction of estrus.

In the urine of both men and women, gonadogens and androgens are found. The identity of the urinary androgens and estrogens has not been fully established.

The bisexual properties of a number of gonadal hormones have been investigated under a variety of conditions. Experiments by Korschensky on gonadectomized rats have established that nearly all the sexual hormones investigated tend to greater or less degree to restore to normal both the male and female sexual organs which have atrophied as result of gonadectomy. Testosterone propionate brings about a return to normal, or even supernormal, of the atrophied sexual organs of castrated males. The same hormone also restores the structure of the atrophied uterus and vagina of an ovariectomized female to a condition not far from normal, like the right of the vagina and the development of some of the tissues of this organ is even supernormal.

The relative effectiveness of the hormones, acting alone in stimulating female sexual organs is as follows: estradiol, estrone, testosterone propionate, testosterone, androstenediol, androstenediol, androstenedione, transhydro-androstene, androstene, progesterone. Transplants of ovarian tissue into the ears of castrated male rats will sustain the accessory organs of reproduction. The bearing which such hormones have on varying grades of intersexuality is obvious.

A number of recent reports suggest that testosterone or testosterone propionate may be useful in gynecological practice. The conditions in which it has been used successfully are cyclic mastalgia, functional uterine bleeding, essential dysmenorrhea, premenstrual tension, and the menopause syndrome. It has also been used for the relief of after-pains. It is as yet too early to state what dosages may be employed safely in any given case and yet be therapeutically effective. It appears that masculinization may be detected if dosages of from 500 to 1000 mgm of testosterone propionate are used in given course of treatment lasting some two weeks. Consequently androgen dosage must for the present be empirical.

It is impossible to visualize the rôle of androgen in the etiology of specific gynecological pathology other than in cases of intersexuality. The fact that such substances are normal excretory products in the urine of women leads one to surmise—as Korschensky has done—that failure to consider the possible interplay of gonadogens and androgens in the basis of the failure in the past, to interpret correctly the endocrine basis of a variety of common gynecological conditions.

Within the past few years, a number of substances have been obtained which bear no structural resemblance to the natural estrogens, i.e., no sterol nucleus, yet they are highly estrogenic. Qualitatively, some of these substances compare with the natural estrogens in potency. The best known of these is stilbestrol.

All reports agree that stilbestrol is a very potent estrogen in women, that it is highly efficient when given by mouth, being but little inactivated in the processes of absorption and utilization (as natural estrogens are, especially in the human being), that it is an effective agent in reducing the number and severity of menopausal flushes, and that it simulates natural estrogens in other important respects. There is *not* agreement, however, regarding the incidence of toxicity nor in the toxic manifestations which it elicits.

The opinions of some authorities on the possible harm from estrogen therapy should warn against long-continued and indiscriminate therapeutic use. In this connection the possibility of carcinoma induced by estrogens cannot be ignored.

The sex hormones are mistakenly regarded as having effects which are confined to the secondary sex organs. Such a view overlooks the fact that these hormones may have other actions and that these, in turn, may have desirable therapeutic effects, or possibly undesirable ones.

The chief clinical use of estrogen for its general effects is in the treatment of the vascular disturbances of the menopause. There is no question about the specific nature of the relief which it affords in the majority of cases. There is evidence that estrogens have a vasodilating action on the smallest blood vessels in certain parts of the body. The following facts suggest this: the injection of estrogen causes swelling and changes in the water content of the sex skin in certain primates, estrogen causes engorgement of the blood vessels in the nasal mucosa, the injection of estrogen in the human being is followed by a fall in the capillary pressure and dilatation of the nail bed capillary vessels, estrogen causes a decrease of venous pressure in the hand, and, finally, estrogen causes a change in the water content of the skin of the rat within a few hours.

The mechanism by which the vasodilating action of estrogen is exerted in the skin vessels of human beings and rabbits has not been established. Facts of an indirect nature support the idea that it may be associated with an increase in the tissues in the concentration of acetylcholine.

The consequences of these vascular effects of estrogens upon the cutaneous circulation remain a matter of speculation. As these vessels are primarily concerned with heat loss from the body, the view has been advanced that at least a partial explanation of the beneficial effects which estrogen exhibits in treatment of the vascular disturbances of the menopause is to be found in increased radiation of heat from the body. This should minimize the need for the intermediation of nervous factors, which result

in sweating, and periods of temporary arteriolar dilatation, as occur in the menopausal flush.

Estrogen causes uterine hyperemia. By means of the initial vasodilatation in the uterus, a ready access of estrogen to the tissues is assured. Subsequently, other, anabolic effects of the hormone are effectively exerted upon the uterus.

The true effects of sex hormones on the formed and unformed constituents of the blood are as yet not established.

The relation of total oxygen consumption to the menstrual and sexual cycle is not clearly understood, but it is established that the sex hormones have marked and characteristic effects upon the metabolism in certain specific tissues. In proestrus, estrus, and during parturition of rats, the metabolism of the liver, ovary, anterior pituitary gland, and thyroid tissues is higher than at other times. These cyclic fluctuations are abolished by spaying, and they may be simulated by the injection of estrogen. The anterior pituitary gland responds first to the hormone, second to the thyroid gland, and third to the liver. In view of the established histological relationships between the anterior pituitary gland and the ovary, on the one hand, and between the ovary and the uterus, on the other, it is probable that the heightened metabolic processes of the pituitary gland bear a causal relation to the concurrently elevated metabolism in the uterus. Because of the rôle of the liver in carbohydrate metabolism, the periodic changes in carbohydrate metabolism in the liver may well contribute to the selective burning of carbohydrates in the uterus during estrus.

Not the least of the numerous effects of the sex hormones is their influence upon the water and salt content of various tissues. Just preceding the time of menstruation one may frequently observe a generalized edema, an increase in capillary fragility, and a retention of sodium chloride. Careful studies on pregnant women have established that the water retention which occurs at this time is associated with the retention of sodium chloride. This is favored most particularly by estrogens, and involves tissues generally. Sex hormones contribute to conditions now known to govern the water and electrolyte pattern of intercellular and intracellular fluids.

The effect of estrogens on the water content of tissues has been demonstrated in the case of the uterus of the rat and monkey and certain other tissues, especially the skin and subcutaneous tissues. The first effect of estrogen is to increase the amount of water in the intercellular phase of the uterus. It shows that an increase in the amount of protoplasmic substance of the uterus is preceded by an appreciable hydration of the tissues. Along with the changes in water content of the uterus are other, equally marked, changes in the electrolyte pattern of the uterus. Present data show that in the follicular phase of the rabbit, the concentrations of sodium and calcium are at a maximum, the potassium and magnesium at a minimum. In contrast, during the luteal phase, conditions are reversed.

Concerning the relation of sex hormones to pigmentation in the skin, if hypopigmented individuals (male or female) are exposed to sunlight, they fall to tan readily although an invisible change takes place in the tissue. Thus, if androgens or estrogens are injected subsequent to exposure to ultraviolet light, pigmentation of the skin occurs without further exposure to light. The relation of this phenomenon to carotene and melanin deposition is unknown.

Regarding oxidation-reduction and sex hormones, there is little one may say at this time about the presence of specific enzyme systems of the uterus and other tissues on which the sex hormones act in order to regulate the necessary energy for various aspects of uterine functions. However the author believes that it is in the determination of the kind and distribution of enzymes, or in the local conditions under which these systems work, that the sex hormones govern the several aspects of reproductive function.

The metabolism of estrogens (interconversion of the estrogens). There are three primary estrogens: estrone, estradiol, and estrinol.

Estrinol is an end-product of estrone and estradiol conversion in the body.

Estrone is modified when injected into rabbits according to the condition of the reproductive tract. Estrone is converted into estrinol in the uterus and for this to take place the uterus must be under active ovarian control, since several months after castration, conversion does not take place. Regardless of whether estrone or estrinol is excreted in the urine, the total estrogen recoverable represents only a fraction of that which is injected; consequently destruction of estrone as well as of estrinol takes place in vivo.

Regarding the destruction of estrogens in the body it seems certain that the liver is primarily involved.

Estradiol is found in only minute amounts in the urine after the injection of estrone into rabbits; there is, therefore, little conversion of the ketone into the diol form. Estradiol is rapidly converted into estrone; this substance is in turn, partially converted into estrinol, provided that functional tissue and progesterone are present.

Progesterone has important effects upon the metabolism of estrogens. It increases the quantity of estrogen excreted in the urine, presumably through sparing action of the estrogens from destruction by the liver enzymes. How this is brought about is not known. Progesterone's second action is in the conversion of estrone to estrinol, in which it acts in conjunction with functional tissue.

The foregoing facts explain the well-known increase in blood and urinary levels of estrogen in the latter (luteal) part of the menstrual cycle. It now appears that in the early interval there is a different type of estrogen metabolism involving a high degree of estrogen destruction. Estrogen production continues at a high level throughout the menstrual cycle with increased excretion, as progesterone spares it from destruction by the liver.

Two other aspects of progesterone metabolism in the endometrium deserve mention. It gives rise to glandular growth and permits ovum growth. The effect of the several primary estrogens on each of these endometrial effects of progesterone is not identical. Estrogen inhibits both egg growth and glandular proliferation, whereas estradiol and estrinol do not, though they decrease the degree of glandular proliferation.

Considerations of the foregoing sort suggest that in the uterine metabolism of estrogen, a chain, or group, of reaction systems acts upon, or requires the participation of, the hormone molecules. "The vaginal effect presumably occurs at a point in the chain wherein rather wide variation in chemical structure does not necessarily hinder activity. Participation in certain of the uterine reactions on the other hand requires more specific structural configuration: the reactions involving ovum growth, for example, are unaffected by certain native hormones which do affect both uterine proliferation and vaginal activity (Pincus and Wertheimer).

The end-products of the metabolism of progesterone in the body are just beginning to be worked out. It is likely that pregnandiol (combined in the liver with glucuronic acid) is the principal urinary end-product of such metabolism in the human. This substance is present in the urine during the latter part of the menstrual cycle. It is present in human urine through pregnancy even after ovariectomy early in pregnancy. This signifies that progesterone is produced in human pregnancy outside of the corpora lutea, most probably in the placenta. Pregnandiol may not be the sole end-product of progesterone metabolism, even in women, because some women excrete pregnandiol in the absence of well-marked premenstrual endometrium; some women with premenstrual endometria do not excrete pregnandiol; and finally pregnandiol is not found in the urine of laboratory animals, even after the injection of progesterone. Since less than half of injected progesterone is recovered in the urine of women, a large share of it remains to be accounted for.

Regarding carcinogenesis and estrogens, the following is of interest. It is possible to produce sarcomas in mice—but only mice that far—by injecting estrogen for long periods of time in immature female or mature male mice of strains in which most of the females develop mammary cancer between the ages of six and five months.

Such tumors are truly carcinomatous, since bits of this tissue transplanted to treated males grow into tumors which are lethal without further estrogen treatment. In immature females subject to prolonged estrogen treatment, cervical cancer may be produced if the mammary cancer which invariably appears first, is repeatedly trimmed away.

To summarize, true carcinomas have been produced only in strains of mice which have a strong genetic susceptibility to carcinomas, without the genetic factor estrogens have never been shown to be carcinogenic.

Estrogens cause uterine growth, eliciting marked hyperplasia of connective-tissue elements in the uterus, with subsequent conversion into smooth-muscle elements. Estrogen favors extensive mitosis in the epithelium of the endometrium in normal growth and repair. Progesterone, in addition to the well known progestational proliferation of the endometrial glands, causes mitotic division of the smooth-muscle elements of the myometrium, it does not, however, favor hypertrophy of these tissues.

Estrogens may influence the condition of the cervical mucus with respect to its suitability for the transmission of sperm and thus be of importance in sterility. The view that a special "bleeding hormone" of the anterior pituitary lobe is responsible for the onset of menstruation is now discredited. The immediate stimulus for menstruation in all proba-

ble menstruation may be induced in monkeys and in women by a variety of methods. It occurs soon after withdrawal of the hormone in a course of estrogen treatment in ovariectomized monkeys or women, it occurs after ovariectomy during a functional cycle, it takes place when the level of estrogen is lowered during a course of injections, it occurs after the withdrawal of progesterone during a course of injections. The onset of menstruation may be inhibited by other procedures. Progesterone, or testosterone, given immediately following any of the foregoing procedures but the last, inhibits the establishment of menstrual bleeding until the progesterone is withdrawn. Estrogen will delay the menstruation associated with ovariectomy, but not that which follows the withdrawal of progesterone. The common physiological denominator for all these various conditions is the state of the superficial portion of the endometrium. In addition to local conditions within the uterus which are responsible for the blanching, there are also periodic systemic changes of an as yet undefined nature which affect the sensitivity of the uterus to hormonal stimulation. Consequently, it appears unlikely that a "cause" for menstruation will ever be discovered, rather, it is more probable that a number of related and interdependent local and systemic conditions will be found indispensable in this phenomenon.

DANIEL G. MORTON, M.D.

Frank, R. T. The Sex Hormones. *J Am Med Ass*, 1940, 114: 1504.

The sex hormones are divided into two groups (a) the prepituitary and prepituitary like, and (b) the steroid (ovary, testis, adrenal, and placenta). The prepituitary and prepituitary-like hormones are of protein composition of unknown structure and act on the ovary and testis, while the steroid hormones have been isolated and their structure determined. These act on the muellerian and wolffian ducts in the immature, adult, and castrate subject. The author points out that a permanent condition of chemical hermaphroditism persists throughout life in the human male and female. How great a

role the sex hormones of the opposite sex play in physiology and functional pathology is as yet an open question. It is possible that they occur as intermediate metabolic products but that under certain conditions they may disturb the balance of sex sufficiently to produce symptoms.

An analysis of the blood and urine assays for normal and abnormal states is given by Frank, who believes that such assays have proved of great help in the evaluation of the various gynecological and obstetrical conditions encountered in practice, and the results of treatment of these conditions. A warning is sounded against considering every obscure condition as being of endocrine origin to the exclusion of anatomicopathological changes which are too often revealed by a routine physical examination.

Absence or decrease of the estrogens and/or of progesterin causes functional disturbances in the female. Functional disturbances in the male are less well defined and are probably due to similar variations of androgen secretion. The steroid hormones when given in small amounts and for short periods stimulate prepituitary function, in large amounts and for long periods they inhibit it. In the female, estrogens are of use in the treatment of infantile gonorrhea and in almost every variety of menopausal disturbance. While they have been used in many other conditions, their effects have not been very convincing. Progesterin relieves dysmenorrhea and may prevent abortion due to defective function of the corpus luteum of pregnancy. Androgens should prove of value in the treatment of castration symptoms in the male and are being tried in many other diseases. The gonadotropic factor of the anterior lobe of the pituitary gland is effective in cryptorchid patients.

ANTHONY F. SAVA, M.D.
Meaker, S. R. Female Genital Hypoplasia. *J Obst & Gynec Brit Emp*, 1940, 47: 40.

The author notes that it is difficult to estimate the general incidence of hypoplasia of the female reproductive tract. Women, pregnant or parous, in whom the functional capacity of the organs has been demonstrated, show an almost negligible incidence of developmental arrests. In a series of 100 nulliparous women who sought relief for inflammatory conditions, the author found that 9 had uteri which presented the obvious stigmata of underdevelopment.

In development, the reproductive system remains stationary until the age of puberty when, normally, it manifests a second phase of differentiation, a phenomenon directly controlled by the endocrine glands. A deficiency of endocrine stimulus, due either to primary failure of the glands themselves or to a depressed constitutional state reacting unfavorably upon their function, may arrest development of the reproductive organs. Focal infections, congenital syphilis, anemia, disturbances of nutrition, and faults of hygiene may be exciting causes. Of 103 girls from sixteen to nineteen years old who had

delayed menarche or other disturbances of menstrual function, 6 were suffering from insufficiency of the anterior pituitary lobe. There were cases of demonstrable thyroid failure, and in 3 girls, non-endocrine constitutional depressions were present, anemia being the most frequent.

The complaint most often presented by genitally hypoplastic women is sterility. The important defect is inadequate ovarian development. If pregnancy occurs the miscarriage rate is high. Excessive bleeding post abortum or post partum is a complication all too to be feared. Another symptom is dysmenorrhea of the spasmodic type. Since the hypoplastic myometrium retains an excessive proportion of connective tissue uterine contractions which should be imperceptible become irregular cramp-like, and painful.

In hypoplasia, the cervix is long, projecting as much as an inch into the vagina, and conical in shape. The os externum is of the plug-hole type. By histological study there may be proportion of connective tissue to muscle as great as 50 per cent, whereas in fully developed uterine muscular elements predominate to the extent of about 90 per cent. Ovaries of the truly infantile type are long, narrow and lobulated. After puberty they are likely to contain retention cysts—sterile follicles which represent abortive attempts at ovulation. Vulval hypoplasia always connotes an important developmental arrest in the internal organs, but the contrary is by no means true, since the majority of women with juvenile uteri show no vulval stigmata.

Using a new diagnostic sign defined by him as the uterine index, the author finds, following the study of a large amount of necropsy material, that in the average case the infantile index persists until the tenth birthday. Rapid development takes place during the thirteenth, fourteenth and fifteenth years and the adult index is attained at the age of nineteen.

As a rule physical examination may give no evidence of retardation of tissue development. Most women whose genital organs are infantile appear in other respects to be perfectly developed. Some patients show stigmata of an earlier inadequacy: disproportion between trunk length and limb-length, masculine distribution of hair, middle third obesity or breasts relatively lacking in glandular elements. These women seldom present the signs of an active endocrinopathy. During the critical period of adolescence they may have passed through transient phases of glandular derangement, followed soon by spontaneous readjustment of the endocrine balance. Such adult patients may be entirely free from symptoms of hormonal failure but the imperfectly developed genitalia are permanent residuum of old disturbances.

Attempts to treat genital hypoplasia in adults are discouraging for after the age of entry the growth impulse is lost. Local treatments may do more harm than good. In certain cases, the growth impulse appearing to be dormant, may be reawakened

by the stimulus of normal sex life. With pregnancy further development of the organs is possible.

The recognition and prompt treatment of threatened or incipient genital hypoplasia in adolescent girls is important, for the growth impulse, though feeble or inhibited, is capable of being stimulated. Abnormal menstrual behavior indicates that development is not progressing as it should. Dysmenorrhea, irregular intervals, scanty flow and secondary amenorrhea are obvious symptoms of subnormal function. Puberty bleeding results from deficient follicular activity and in particular from a lack of the corpus luteum hormone. Eighty per cent of white girls living in temperate climates have their first period before the fifteenth birthday and 85 per cent before the sixteenth birthday.

The author states that girl who has not established regular menstruation, and relatively painless menstrual habit before her fifteenth birthday requires survey of her general health and her endocrine balance. If the delay extends to the sixteenth birthday she becomes an emergency case, demanding thorough investigation and energetic treatment. Examination by rectum will assist in ruling out hermaphroditism, imperforate hymen, and incidental abnormalities. Both endocrine and non-endocrine disorders in the adolescent girl should be considered as factors capable of arresting genital development. The primary effect of endocrine therapy is replacement. The medication indicated most commonly anterior pituitary lobe hormone, less often thyroid, and never ovary. Success depends upon accurate diagnosis and upon the use of potent preparations in adequate dosage over sufficient length of time.

Among non-endocrine constitutional diseases, there are two which require special attention: chronic focal infection and anemia. Chronic infection of whatever origin, especially from teeth, tonsils or nasal sinuses, can exert upon the endocrine glands an inhibiting influence strong enough to depress normal function and to prevent the satisfactory results of organotherapy. Anemia is rather common in adolescent girls, and the milder grades often escape recognition but the blood should be watched and treated on the slightest indication, since the effect of my anemia upon genital development is sometimes more harmful than would be suggested by the blood picture.

Two items in an ideal hygiene that bear so directly upon the well-being of adolescent girls are proper nutrition and a good balance between effort and relaxation. If the body suffers, no small part of the damage is likely to be visited upon the sensitive reproductive organs. HENRY F. TIERCEY, M.D.

Mittelblonica, E. von: Simple Puncture as Palliative Treatment in Psoas Accumulations in the Female Pelvis (Die einfache Punktion als palliativ-therapeutisches Verfahren bei Lipoaromatosen des weiblichen Beckenraumes). *Monatsschrift für Geburt und Gynäk.* 1939, 99, 50.

After review of the literature on the results of treatment of pelvic suppurations with simple puncture

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Miller H. E. Ectopic Pregnancy: A Review of 137 Cases. *Am. J. Surg.* 94, 43-47

Miller presents review of 137 cases of ectopic pregnancy that occurred at the Touro Infirmary, New Orleans, during the period of from 1924 to 1936. He reports the high uncorrected incidence of extra-uterine pregnancy: 51 intra-uterine pregnancies (66 per cent) in New Orleans hospitals during this period. One hundred and thirty-four of the cases of his series were tubal in type; 2 were interstitial, and 1 was ovarian.

The usual theories of causation of ectopic nidation are briefly considered. Miller suggests that tubal obstruction plus a decidua response in the tubal mucosa, as a complementary influence, would create a favorable soil for implantation in order for ectopic pregnancy to result. His comments on the percentage occurrence of ectopic pregnancies following suspension of the uterus and procedures purposed to relieve pelvic and abdominal diseases. Only 4.6 per cent of his cases revealed pathological evidence of salpingitis; 8 per cent showed abnormal vaginal bleeding, while history of amenorrhea occurred in 5.8 per cent. The most usual physical finding was tenderness in the lower abdomen (8 per cent). Findings in the blood count and smear reveal changes dependent on the amount and time of the intraperitoneal hemorrhage.

Miller is pessimist regarding the diagnosis of ruptured ectopic pregnancy and states that it is attended with the same high death blowes the golfer who scores a hole in one. The diagnosis in all cases was made correctly in 47.2 per cent and highly considered in an additional 23.5 per cent.

The author believes there should be no expectant treatment for ectopic pregnancy and recommends immediate surgery. He adds that the time for administration of fluids is during, or after the control of the hemorrhage by ligature. The extent of the operative procedure must be regulated by the judgment of the surgeon and the condition of the patient. The excellent mortality of 2.8 per cent in 37 cases reported. WILLARD G. FRENCH, M.D.

Reifferscheid, W. and Schulermann, R. Roentgenological Studies of So-Called Intra Uterine Respiration of the Fetus (Roentgenologische Untersuchungen ueber das sogenannte intra uterine Atmung des Feten). *Ber. d. phys.-med. Gesellsch. Bonn*, 1936, 6, 302.

While repeating Ehrhardt's observations of intra-uterine drinking by the fetus, radiopaque shadows were observed in the region of the lungs. This observation became the basis of roentgenological observations of intra-uterine fetal respiratory movements which have been previously described by Ahlfeld, K.

Reifferscheid and others. By means of injecting umbilicor into the amniotic fluid of seven late pregnancies had to be terminated because of medical indications. It was possible to deposit a contrast medium in the fetal lungs and to demonstrate it in the fetus while yet in utero by roentgenograms. In histological studies it was possible to prove that the umbilicor had been deposited in the lungs.

From these observations it can be said that the muscle contractions of the intra-uterine fetus occurring in rhythm with respiration, described by Ahlfeld, K. Reifferscheid and others, can be explained roentgenologically as intra-uterine respiratory movements in which amniotic fluid is actively moved back and forth within the bronchial tree. The fetal respiratory movements could be demonstrated as early as the fourth or fifth month of pregnancy.

(W. REIFFERSCHIED) RUDOLPH W. RAWSON, M.D.

Jacobs, J. Placenta Previa. Roentgen Diagnosis, Treatment, and Technique for the Induction of Premature Labor. *Am. J. Surg.* 94, 48-51

Improved means of diagnosis have made it possible to recognize placenta previa at the first bleeding, and to distinguish partial and total previa in the cystogram. Roentgenographic studies will indicate the presence of monostrutia; also, the center of ossification in the fetus reveal in advance whether it is viable. The knowledge thus obtained enables the accoucheur to choose the method of treatment best suited to the individual case, without loss of time and blood.

In inducing labor the importance of stimulating its onset by making direct pressure upon Frankenhauser's great cervical ganglion is emphasized. The author presents a method of inducing labor based on this principle, and describes his technique, which he has employed for over twenty-five years, and which he believes should be considered in carefully selected cases and in some cases of placenta previa.

J. THOMAS WILLIAMS, M.D.

Portes, L., and Varangot, J. Endometriosis and Pregnancy (Endométriose et grossesse). *Gynec. et obst.* 939-940, 40-703

Portes and Varangot note that the association of endometriosis and pregnancy is rare because women with endometriosis are frequently sterile and because endometriosis occurs most often in the fifth decade of life, an age at which pregnancy rarely occurs. In the case reported, the patient was a woman thirty-two years of age, in the seventh month of her second pregnancy. She had had no unusual symptoms, but mild flow on making vaginal examination, forced blood. The patient was sent to the hospital at once and examination with the speculum showed a tumor that bled easily; the right lateral vaginal cul-de-sac. A histological examination at that time led to the

GENITO-URINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Firor, W M The Treatment of Addison's Disease by the Implantation of Synthetic Hormone
Ann Surg, 1940, 111 942

The clinical syndrome of Addison's disease has been known for eighty-four years, its pathological physiology only ten years, and the crystalline substance curative of its symptoms only two years. In this article are well presented the historical milestones of the growth of our understanding of this disease since the time of Addison.

The immediate impetus to this paper was given by (1) the isolation of the synthetic hormone by Steiger and Reichstein, and (2) by the work of Thorn of the Johns Hopkins Hospital, Baltimore, Maryland, who maintained bilaterally adrenalectomized dogs on single daily injections of desoxycorticosterone acetate despite a low sodium-chloride and high potassium diet. Subcutaneously implantation of sufficient pellets of the crystalline hormone maintained these animals equally satisfactorily. Cessation of the daily injections or removal of the pellets induced a clinical syndrome identical with that of Addison's disease. Pellet implantation was 25 per cent more efficient than daily injections in oil.

Since September, 1938, Thorn and the author have treated 17 patients at the Metabolic Ward of the Johns Hopkins Hospital by pellet implantation. Daily requirements were first established by adding 10 gm of sodium chloride to the basal state of the patient and then giving daily injections of from 2 to 10 mgm of "percorten" according to the patient's needs. Evidence of adequate therapy was taken to be the maintenance of (1) optimum body weight, (2) normal blood pressure with normal plasma volume, (3) positive sodium and chloride balance, and (4) the normal concentration of plasma electrolytes. When the daily requirement was determined the injections were stopped and pellets implanted on the basis that each 125 mgm pellet was equivalent to 5 mgm of the hormone in oil daily.

Implantation is done in the infrascapular region under procaine anesthesia with rigid asepsis. Incisions are made in the subcutaneous fat and 10 or 12 radial pockets made by blunt dissection. Hemostasis is completed and the pellets are introduced with a nasal dilator. In the author's group of 17 patients all have been successfully maintained on pellets alone from four to nine months. All but 2 have resumed their former activities fully. Every patient has gained weight, shown improvement in blood pressure, maintained a positive sodium and chloride balance, and the blood volume determinations have returned to normal. No untoward effects have been reported. All wounds have healed promptly and painlessly, no pellets sloughed out. None of the patients has developed hypertension, a fact attrib-

uted to the carefully computed daily requirements. In 1 patient partial regeneration of cortical tissue is suspected.

The author concludes with the words of warning that improperly prepared pellets will crumble and greatly increase the rate of absorption and that sterilization of the pellets as now practiced with hot acetone solution of the crystalline hormone, Seitz filtration, and, finally, low-pressure steam sterilization, is still very imperfect. Finally, it must not be forgotten that pellet implantation does not obviate the necessity for simultaneous careful clinical supervision.

STANLEY ROBBINS, M D

Korenchevsky, V, and Ross, M A Kidneys and Sex Hormones *Brit M J*, 1940, 1 645

These authors report a study on the kidneys of intact and castrated rats receiving various male and female sex hormones.

They report that gonadectomy in males produces small "castration" kidneys. This did not follow in females. In both normal and gonadectomized female rats and castrated males the male hormones produced true hypertrophy of the kidneys. Except for pathological changes produced in the kidneys of normal females by large doses, the action of testosterone esters on these organs appears to have no harmful effect. Estrogens in certain doses produced peculiar cyst-like degenerative changes in the kidneys mostly confined to the boundary layer of the cortex and medulla.

RULON W RAWSON, M D

MISCELLANEOUS

Lima, E J The Action of the Derivatives of Sulfanilamide in the Treatment of Lymphogranulomatosis Inguinalis (Acción de los derivados de la sulfanilamida en la enfermedad de Nicolas Fabre)
Bol y trab Acad argent de ciruj, 1940, 24 11

Lymphogranulomatosis inguinalis was first recognized as a venereal disease and a clinical entity by the German school (Frei and Koppel). This disease shows all the symptoms of the venereal diseases: lesions on the skin, mucous membranes, lymphatic system, and nervous system. It resembles syphilis in that it has as a first manifestation chancre and inguinal gland involvement. The most important symptom for diagnosis is the positive reaction of Frei. The author thinks this reaction can be compared favorably with the Wassermann reaction, and that a negative reaction, after long treatment, is a good sign of cure of the disease.

Negativity of the Frei reaction, as the result of treatment, is very seldom found and, for this reason, the disease can be considered much more serious than syphilis. Its manifestations are also rebellious to treatment and they follow the same course as those of syphilis. Therefore, there is first a primary

period with little chancres, without infiltration, with gland involvement, and a positive Frei test. The secondary period brings cutaneous lesions with rectal and vulvovaginal complications. The tertiary period is one of latency. If good treatment produces negative Frei reaction, the disease does not accept this as a cure till the clinical signs disappear also.

The treatment with the sulfanilamide derivative (prontosil) was made with all the necessary precautions against the general toxic complications (headache, asthenia, polyneuritis, and the toxic local complications (gastric, hepatic, cutaneous, nervous, and renal).

Prontosil was given per os and as injections (5 c.c.m. of 5 per cent solution) for three weeks the patient has been given the full dose of medicine. As an example in a patient of 60 kgm. weight, the substance is given as follows:

First week .5 gr for each kgm. of weight, 3 gr day for seven days, so as to total 21 gr the first week.

Second week 0.04 gr for each kgm. of weight, 2.40 gr day a total of 6.60 gr in the second week.

Third week .03 gr for each kgm. of weight, .3 gr day a total of .60 gr in the third week.

The full dose is 50 gr.

After the first treatment one can see a modification of the inguinal condition (which sometimes progresses spontaneously) but the rectal and genital lesions and the Frei reaction do not change at all. As one might think that the action of the sulfanilamide was upon the infection, the author combines this treatment with the necessary treatment of the general state of the patient. He treats also the determining causes of the disease, trying to obtain sterilization with gold, copper, sodium iodide, and sulfanilamide in successive series, and treats the local lesions which are greatly improved by the combined general treatment. Each treatment is followed by a period of rest, after which new aftertreat injections of the same drugs are made for a three-week period. HECTOR MARVA, M.D.

CORRECTION

Paloczko, I: Proctopexy of the Ureter (*Ueber das Harnleiterverfall*) *Arch. klin. Exp. Univ. Med.*, 1930, p. 103.

In the abstract of this article which appeared on p. 54 of this volume, the word *ureterocoele* should be substituted for the word *urethrocele*.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC,

Campbell, A M G Carcinomatosis of Bone Difficulties in Diagnosis *Lancet*, 1940, 238 777

Five cases of carcinomatosis of bone are discussed, in all of which an original diagnosis of rheumatism was made. Later studies proved them all to be secondary or metastatic carcinoma from a primary tumor which had given no symptoms.

Pain, anemia, and the radiological findings lead to the diagnosis, but in the early stages the latter two may be negative. The possibility of metastatic carcinoma must be borne in mind in unexplained bone and joint pains in older patients. Repeated roentgenograms and prolonged observation is advisable in obscure cases.

CHESTER C GUY, M D

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC

Costantini and Kehl Arthrodesis in Tabetic Arthropathies (Pour l'arthrodèse dans les arthropathies tabétiques) *Presse méd*, Par, 1940, 48 308

Arthrodesis has not been an accepted method of dealing with the flail joints of tabes, principally because it was believed that tabetic bones had little power of regeneration. Rare cases have been reported with success, but as a rule French surgeons have discouraged any attempt at surgery. The authors point out that, whereas the attitude may have been justified before 1914, there is much better outlook today. The principal reason for being more optimistic is the very much improved treatment of syphilis. They also argue that the observations of Leriche on improved osteogenesis in the presence of hyperemia produced by sympathectomy have not been taken into consideration, and the hyperemia of tabetic extremities is probably similarly on a neurogenic basis.

Their first attempt at arthrodesis in a Charcot knee joint of a bedridden patient was entirely successful. The arthrodesis was accomplished by means of a thick tibial graft from the opposite leg. The same year another knee was ankylosed in a similar manner. There is a chronological history of successful arthrodeses on tabetic joints. Much is made of a successful extra articular arthrodesis of the hip by Mathieu. The article deals at some length with the idea that because of a few disappointing results in the surgical treatment of these joints in former days, surgeons have not been sufficiently energetic in their treatment. At present, the improved technique of arthrodesis, especially with use of the Albee graft, combined with improved treatment of the underlying conditions in the patient, make the outlook for successful surgical intervention much more hopeful.

ADRIEN VERBRUGGHE, M D

Orell, S Osteosynthesis in Resection of the Knee-Joint (À propos des ostéosynthèses dans les résections de l'articulation du genou) *J internal de chir*, 1940, 5 147

In cases of resection of the knee by the Waldenstrom method in which only the fibrous tissues of the joint are sutured and the limb is immobilized in plaster, Orell has found that results are not always satisfactory. He prefers some method of osteosynthesis. At first he used a straight bone graft, pointed at one end, the pointed end was introduced into the spongy bone of the tibia, the opposite end into the femur, and the knee was placed in a plaster cast immediately after operation, but the foot left free.

While very satisfactory results were secured by this method, including 6 cures without complications in 10 cases of tuberculosis of the joint, the author has sought to improve the results and avoid complications by the use of a curved bone graft (*os purum*). The major part of this graft is of compact bone, but spongy bone forms the convex surface. This graft is also pointed at one end. After resection the tibia and femur are held in the correct position, and a specially designed perforator of the same shape as the bone graft is employed to form a channel in the femur and tibia, with the aid of a few blows from the surgical hammer. The perforator is withdrawn with the use of an iron instrument. The bone graft is placed in this channel with the pointed end in the spongy bone of the tibia, a special guide of bakelite is used to facilitate the placing of the graft. The

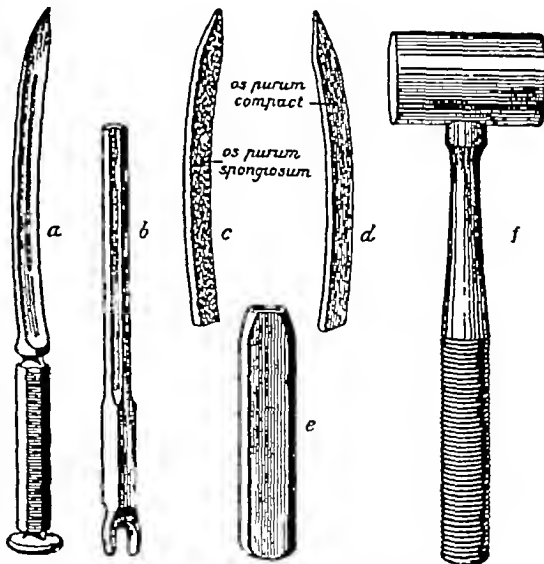


Fig 1

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First week 5 gr for each kgm. of weight 3 gr day for seven days, so as to total 21 gr the first week.
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CORRECTION

Palecako, L. Prolapse of the Ureter (Tubercle Intersternall) *Arch. chir. Als. Univ. Prct.* 1932, p. 103.

In the abstract of this article which appeared on p. 154 of this volume the word *intersternall* should be substituted for the word *urethrocoel*.

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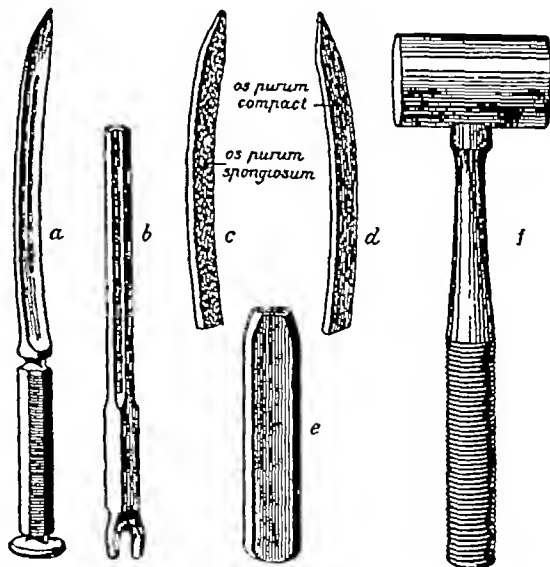


Fig 1

knee is then immobilized in plaster cast. If this voluntary osteosynthesis is obtained, the spongy bone of the concave surface of the graft adhering closely to the spongy bone of the tibia and femur.

It is important that the graft of os purum be thoroughly dry when introduced into the bony channel prepared for it. It is boiled in physiological saline solution the afternoon of the day before it is to be used and dried overnight either in sterile gauze at room temperature or by dry heat at 50° or 60° C. The author has treated 6 cases, 5 cases of tibia-femur lesions of the knee joint and 1 case of gonorrheal arthritis by resection of the knee-joint followed by the use of the bone graft described. The results in 4 of these cases were excellent in 3 cases there were complications due to infection of the soft part, the bone graft in these cases, however, was firmly fixed in position.

ALICE M. MYERS.

FRACTURES AND DISLOCATIONS

Herrmann, O. J. Compound-Fracture Therapy at the Boston City Hospital. *Arch Surg* 1940, 40: 853.

An outline is given of the steps taken in the care of a patient with a compound fracture from the time he is admitted to the hospital. The technique of wound cleansing and debridement is discussed.

The use of internal fixation is not contraindicated and does not contribute to the development of sepsis. The puncture type of wounds should be debrided in the same manner as the more extensive soft-tissue wounds. In the closure of the wound, either the open or closed method may be used. In the treatment of compound fractures the surgeon should be open-minded and vary his technique as the case requires. Bone grafting may save much time in cases of delayed union.

The treatment of gas-bacillus infections and tetanus is also discussed. CHRISTIE C. GUY, M.D.

Gullherme E. Some Notes on the Treatment of Recent Compound Fractures (Algumas notas acerca do tratamento das fracturas abertas recentes). *Rev. bras. de cirurg. traumatol.* 1940, 10.

During 1937 Gullherme and his collaborators treated 10 cases of recent compound fracture by careful excision of the focus. Six patients died from septicemia and 4 from gas gangrene, and 3, who had compound fractures of both legs, died within twenty-four hours after the operation. Gullherme warns that the method can be used only by experienced surgeons who are in a position to judge correctly the degree of vitality of the involved soft tissues. There are two problems in the treatment of open fractures: the surgical treatment of the soft tissues, upon which depends the immediate prognosis, and the orthopedic treatment of the bone lesions, which is responsible for the remote results.

Excision of the skin and the subcutaneous cellular tissue offers no difficulties even in extensive injury because all pockets can be found and kept clean by

the judicious use of counteropenings for drainage. However, difficulties arise when the aponeurotic band is excited and an irregularly destroyed or ischemic muscular mass is found, because this tissue is always the starting point of gas gangrene or of gangrenous phlegmon. Individual experience is indispensable in these cases, as shown by the personal statistics which improve gradually with the lapse of time.

It is always necessary to perform the excision so as to leave a muscular stump of living, bleeding tissue, presenting a healthy aspect. The nerves must be respected and eventually reconstructed, and the principal vessels must be saved. There is no contraindication to excision, which is then replaced by amputation, destruction of the principal artery or of the large nerves. The only excuse for removal of bone splinters is when they are found far from the focus of fracture. In principle, all bone fragments should be replaced in position, especially those provided with periosteum and osteosynthesis should not be used. At most, catgut ligature may be passed around them; they are kept in position by the reducing traction.

Whenever reconstruction is possible, the skin only should be sutured; tension on the sutures may be prevented by parallel incisions and moderate undermining of the subcutaneous cellular tissue. Where suture is impossible, the wound is allowed to granulate under the plaster cast. A compress is placed over the wound. Focal and peripheral mixed serum therapy against tetanus and gas gangrene is given before the cast is applied.

No padding is used under the plaster cast which must provide strict immobilization and be extensive, open fracture of a lower extremity. Cast should be applied to each of the extremities and the casts should be connected or joined by transverse bars.

The principle of infrequent dressings must be observed. From the beginning, the cast will be stained with blood and may even be soaked with it; if hemostasis has been well controlled at the time of the operation, the temptation to open the cast in order to discover the source of bleeding must be resisted.

It is always possible to obtain reduction by means of Kirschner pins passed through the bone. The member must be kept elevated in order to avoid the development of edema. The course of calcification is followed roentgenographically. Usually the plaster cast can be removed from the lower extremity after from sixty to seventy days, and from the upper extremity after from thirty to forty-five days; at this time, the wound is generally found to be healed without ossification of the scar.

RICHARD KIRBY, M.D.

Baermann, E. Fractures of the Head of the Radius (Die Brüche des Radialepiphysen). *Arch. f. klin. Chir.* 1939, 97: 1.

After a review of the literature which demonstrates the inadequate state of our knowledge of

fractures of the radial head, the anatomy and physiology of the elbow joint are described. The author has treated 52 cases of his own. Forty three of these resulted from direct trauma, 7 from indirect. In 2 the form of trauma was not clear. The 7 injuries resulting from indirect trauma were 7 fractures and 1 crack fracture. Among the 43 indirect injuries there were 23 fractures, and 20 fissures and cracks. The average age of the patients was thirty-six years. The indirect injuries resulted from falls on the palm of the hand. In the 52 injuries there were no other complicating fractures.

Five types of fracture are differentiated for the purpose of treatment: (1) incomplete fracture of the head, (2) complete fracture of the head, (3) incomplete fracture of the neck, (4) complete fracture of the neck, and (5) fracture of the head and epiphyseal injury in children. Every single type of fracture falls into this classification. The 52 cases treated by the author are tabulated.

The following symptoms are diagnostically important: painful restriction of rotary motion especially in the direction of supination, restriction of flexion and especially of extension of the elbow joint, and local tenderness to pressure and also to percussion by an axial blow on the radius.

The author agrees with recent observers and recommends closed treatment whenever possible, but otherwise operative treatment. The removal of the radial head gives unsatisfactory results. Boehler and Pfah have always found permanent disturbances of function following this method. The author treated only 3 of his 52 patients by operative methods, all 3 having suffered direct trauma.

The fractures due to indirect trauma are for the most part more serious. Oppolzer has maintained that fractures of the radial head in children should always be reduced by closed methods. Under ethyl-chloride anesthesia the forearm in forced extension is brought into varus, the operator using his thigh as a fulcrum. A simultaneous pull is made on the forearm and the joint space opens. By a pressure with the thumb from the lateral side the displaced head is brought back to its original situation. Immediately the forearm is slowly pronated and the elbow flexed. Immobilization is maintained for from two to three weeks in a dorsal unpadded plaster slab, following this, hot soaks are administered and active exercises are prescribed.

The author states that in retrospect his treatment is to be regarded as partly poor, as is shown by the average incapacity period of forty six and four tenths days and the average treatment period of seventy nine and four tenths days. Among the 24 cases treated from 1911 to 1915 with soothing ointments and after a few days with occupational therapy 17 cases with disturbances of function have remained. Of the 25 patients treated with immobilizing bandages since 1916 only 7 have persistent disturbances of function. Immobilization for at least two weeks is indicated.

(BUTTS.) RICHARD WAFER, M.D.

Scaglietti, O. The Present Status of the Treatment of Congenital Dislocation of the Hip (Indirizzi odierni nel trattamento della lussazione congenita dell'anca). *Chir. d'organi di movimento*, 1940, 25, 308.

The author presents a review and statistical analysis of the cases of congenital dislocation of the hip in Italy. Of the total number of 15,272 cases, 12,747 (83.46 per cent) were found in females and 2,525 (16.53 per cent) in males, thus the ratio of males to females was 1 to 5.04. Dislocation was unilateral in 8,226 (57.13 per cent) and bilateral in 7,046 (46.13 per cent). Of the unilateral cases, 65.6 per cent were on the left side and 34.33 per cent were on the right side. According to the geographical distribution, it was found that the condition occurred more frequently in northern than in southern Italy and less frequently in the mountainous regions than in the plains.

At the Rizzoli Institute, 777 cases were treated by simple abduction, 3,628 cases by the Paci-Lorenz non operative method, and 176 cases by operative reduction. Of the first group of 777 cases, 736 (94.71 per cent) were diagnosed and treated during the first twelve months of life. Treatment consisted of progressive reduction by maximum abduction and internal rotation according to the principles of Putti. The author used the apparatus of Forrester and Brown. The average duration of treatment was from seven to nine months. Of these cases, 478 were followed up and examined clinically and radiologically. The fact that excellent results were obtained in 93.92 per cent of them shows the importance of early treatment, as previously emphasized by Putti.

In the group treated by the non operative Paci-Lorenz method, good results were obtained in from 45 to 50 per cent. The author states that poor results according to Putti were due to two types of causes: mechanical and biological.

From 1809 to 1938, 176 (3.52 per cent) of 4,900 cases of congenital dislocation treated at the Rizzoli Institute were treated by operative reduction. The technique of Putti and Zanoli was employed. Of this number, 86 cases had been treated previously without success by non-operative methods, 24 had presented recurrence, and in 66 primary operative therapy was considered preferable either because of age or anatomical conditions. Forty-nine cases were followed up, of these 5 were bilateral. Good results were obtained in about 25 per cent.

The author then briefly reviews the results in the statistics presented by Gill in America, Leveuf in France, and Schede in Germany.

He emphasizes certain rules for non-operative reduction which he states are well known. Various other important factors in the treatment are briefly reviewed. He calls attention to the fact that the operative method of therapy will give better results than the non-operative method and that one of the most important factors in obtaining good results is early recognition and treatment.

MICHAEL DEBAFEE, M.D.

Da Costa Bonifim, R. Monteggia's Fracture; 2 Cases. Posterior and Anterolateral Dislocation (Fractura de Monteggia: proposito de dois casos: luxação posterior [luxação antero lateral]) *Rev. bras. de orthop. traumatol.* 1950, 5

Isolated fracture of the diaphysis of the ulna is rare. When after traumatism the ulna is found to be fractured and the radius intact, the latter should be suspected of dislocation of its upper extremity. Fracture of the diaphysis of the ulna and simultaneous dislocation of the head of the radius constitute Monteggia fracture, which is characterized by a high incidence of bad functional results, because the dislocation is often unrecognized. D. Costa Bonifim describes cases which he treated successfully.

Monteggia fracture, while rare, is not exceptional. The diaphysis of the ulna is usually fractured in its upper third, occasionally in its middle and very seldom in its lower third if the fracture occurs in the coronoid process or in the olecranon. It should not be classified as Monteggia fracture. The simultaneous dislocation of the radius is nearly always anterior or anterolateral posterior dislocation as in the author's first case, is rather rare. Three mechanisms are considered in the production of Monteggia fracture: (1) direct and most frequent one in which there is violent injury of the posterior aspect of the forearm; (2) direct-indirect one, in which the patient falls on uneven ground, suffers direct fracture of the ulna at the point of impact, and on rising dislocates the radius by violent pull of the biceps; and (3) an indirect-direct one, in which the patient falls on the palm of the hand and suffers a direct dislocation of the radius by the impact of the forearm on the ground, and an indirect fracture of the ulna. The last two mechanisms should be called indirect.

Careful examination will often lead to the correct diagnosis, but extreme pain may prevent the maneuvers necessary to make complete investigation. Besides, edema may mask the landmarks of the region. In these cases the patient may be anesthetized to allow adequate examination. Frontal and lateral roentgenograms are indicated, the first with the forearm in extension, and the second with the forearm in flexion at an angle of about 90 degrees and in supination with the thumb directed upward.

Early reduction is necessary and with correct technique will nearly always be possible within the first hours without surgical intervention. Reduction should also be tried if the patient is seen several days after the accident. In old lesions, surgical methods are considered advisable. The author technique includes:

Disinfection of the area with iodized alcohol and the injection of 5 cm. of 1 per cent solution of novocaine into the hematoma and of 20 ccm. into the hematoma of the fracture.

With the patient in dorsal decubitus the arm abducted in horizontal position and the forearm flexed to right angle counterextension is applied to the arm just above the elbow.

3. The corresponding hand of the surgeon grasps the hand of the patient and exert gradual strong traction while the other hand embraces the forearm and with the thumb verifies progress and guides the head of the radius in front of the condyle. When the ulna is reduced, its curvature is corrected by counter pressure and the course of the radial head is traced under movements of pronation and supination.

4. A snapping sensation reveals reduction of the dislocation, and pronation and supination become ample and free.

5. Under continuous traction, flexion of the forearm is increased to stabilize the reduction, and the alignment of the fracture is again verified.

6. An assistant continues the traction while the plaster cast is applied with the forearm flexed to right angle or more in pronation, and with the thumb pointing upward. A posterior plaster splint is applied directly on the skin from the axilla to the wrist, including the cubital border of the hand. The anterior aspect is protected by a light layer of cotton wool from the arm to the wrist, and the splint is completed with few circular turns of plaster bandage. If the hematoma is serious, it is advisable to put the arm in abduction to the horizontal in order to favor the circulation. The after-treatment consists of active movements; the patient should be taught to try to move the blocked joints even during immobilization, in order to maintain the tone of the periarthicular muscles and to prevent stiffness.

In old cases with faulty consolidation of the fracture, osteotomy is indicated and bloodless reduction of the radius is first tried. If this fails, open reduction is necessary. Resection of the head of the radius is done and always decreases the serious limitation of movements of the elbow. **RICHARD KREIER, M.D.**

Vidal, F. J. Gunshot Fractures of the Femur: Experiences from the Spanish War (Obersehenid schussverletzungen—Erschossenen und deren spanischen Krieg) *Chirurg* 1940, 70

Six hundred gunshot fractures of the femur were treated following the principles of Boehler and Schaefer. As initial treatment on the field, the Crumer splint has proved the best. The wounded men with emergency dressings arrived at the classifying ambulance station living 20 or 30 km. behind the front. All the gunshot fractures with small ingress and outlet sharpshaped wound were treated with strict conservatism, and they healed like closed fractures. All the others are operated upon.

The author advises excision of the skin and other wound care. There should be no forcible removal of large splinters, no chemical disinfection, and no suturing. He finds plaster cast including the pelvis, in the Boehler screw-traction dressing the best form of transport dressing. The limb is maintained with small amount of mobility in the knee and hip joints. Blue crayon is used for writing details on the dressing for the subsequent case history. After this the patient is brought to the central

military hospital, about 200 km. behind the front, in about nine hours, so that the wounded come under definitive treatment on an average after twenty-four or forty-eight hours. Each bed has a Boehler thigh splint, a wooden step for elevating the foot of the bed, two 5 kgm. weights, a stand on which the limb may be rested when in maximal abduction, support for the well foot, and a traction stirrup. The splint is removed, roentgen exposures are taken in two planes, and permanent traction is applied. 15 mm. of thick non rusting steel is passed through the tibial tuberosities with an electric drill without local anesthesia, the wire is made taut in a Boehler or other form of stirrup, and, finally, the anterior part of the foot is suspended from the apparatus by an adhesive plaster dressing. Thirty cases of gunshot fracture of the thigh could be handled in this manner during a forenoon.

The wounds receive open treatment after the method of Vincenz von Kern, all further operative procedures are carried out in bed under continuous traction, which remains in force, as a rule, for six weeks. Three or four weeks after the start the continuous traction is carried on by a supracondylar pin. Following the six weeks of continuous traction, if the wounds are in the process of healing, the patient is usually put up in a pelvic plaster cast with extension of the thigh, and a walking iron stirrup. A few weeks later a circular plaster splint is applied, the plaster being worn for an average of two and one-half months. The entire period for consolidation of the fracture therefore takes a total of four months. There are, however, instances in which the plaster must be worn for six months or longer. Roentgen control is necessary every eight to fourteen days at first. Adhesive dressing is used after removal of the

cast and then after fourteen days, approximately, this is removed and the patient is granted sick-leave with instructions to practice movement, above all, to keep the joint moving. Although physical therapy was not practiced at all, the results were very good. The author never practiced early removal of shell splinters, many of these came out because of supuration, others were later found included in an abscess. Sequestra were never removed earlier than six months after the first dressing.

Of 600 patients with gunshot fractures of the femur, only 22 (3.6 per cent) died, 1 of tetanus, 3 of gas gangrene, 6 of hemorrhage, and 12 of sepsis. In this connection it is interesting to note that the author himself admits that he was perhaps too conservative, as earlier amputation might have saved a life in some cases, although he did 2 amputations for gas gangrene and 8 for sepsis. Among the 578 patients who remained alive, there was not a single instance of amputation and not a single example of pseudarthrosis. Shortening of more than 3 cm. was present in only 1 patient, who had a shortening of 5 cm. This patient, however, did not receive care in the author's station but at another. In 4 of the 6 patients who died of hemorrhage, the femoral artery was the vessel involved, in the 2 remaining, the profunda. Of the patients who died of sepsis, 3 had coincidental suppuration of the knee as a complication. It is to be emphasized that the station in the first twenty-one months had only 1 death from sepsis, the 11 other deaths occurred in the last five months, 6 in the last month during the mass emigration. The author ascribes the incidence of death in the last periods to the poor nutritional care and poor transportation facilities.

(FRANZ) JOHN W. BRENNAN, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Holling, H. E. The Etiology of Vascular Symptoms Occurring in Cases of Cervical Rib. *Gay Hist Rep* Lond., 1919, 20, 215.

Symptoms caused by a cervical rib may be either nervous or vascular. The nervous symptoms result from pressure of the rib on the brachial plexus. The origin of the vascular symptoms remains in doubt. Interference with the blood supply may arise from pressure of the rib either on the subclavian artery or on the vasomotor fibers to the arm. The relative importance of these factors is in dispute.

Two cases of cervical rib showing vascular symptoms are described. Both were greatly relieved by removal of the cervical rib. In the first case, there was a cervical rib on the right side with vascular changes in the hand. Obstruction to the blood supply of the arm occurred whenever the arm was abducted. At operation it was found that intermittent arterial obstruction was caused by compression of the subclavian artery between the cervical rib and the clavicle. Following the removal of the rib the circulation to the right arm steadily improved. In the second case a cervical rib on the right side caused marked disturbance of the arterial supply to the arm and gangrene of the terminal portion of the thumb. At operation, the subclavian artery appeared to be compressed between the anterior end of the rib and the clavicle when the arm was abducted. Removal of the rib resulted in subsidence of the symptoms and steady improvement of the blood supply to the arm.

The views as to the causation of vascular symptoms in cases of cervical rib are discussed. Evidence is given for the belief that the symptoms are secondary to damage to the arterial wall inflicted by the cervical rib.

The artery may be compressed by the cervical rib at the lateral border of the scalenus anticus or between the anterior end of the rib and the clavicle. It appears probable that the latter is the more common mechanism of compression.

HERBERT F. THURSTON, M.D.

BLOOD; TRANSFUSION

Takenouchi, T. The Change of the Circulating Blood Volume from Blood Transfusion and Infusion of Isotonic Gum-Arabic Solution in Normal as well as Splenectomized Rabbits (Veränderung der zirkulierenden Blutmenge durch Bluttransfusion und Infusion von isotonischer Gummialbumin bei normalen sowie entzirkulierten Kaninchen). *Folia J. J. per Med.* 1920, 37, 57.

The transfusion of blood or intravenous infusions of colloidal solutions of gum-arabic and gelatin represent widely distributed therapeutic measures for the replacement of the blood volume in acute blood

loss. It certainly is conceivable that when in anemia these solutions which compared to other solutions such as Ringer solution or physiological saline solution are difficult to diffuse are introduced into the circulation, they remain in the circulation for longer time than the Ringer and physiological saline solutions and thus increase the circulating blood volume. However the change caused by the infusions of the first mentioned solutions in cases in which there is no deficiency of the blood volume is of great interest, as well as the manner in which the organism overcomes the excess blood volume.

From previous experiments, it may be assumed that in blood transfusion, especially if excessive amounts of blood are deposited in various blood depots, some of the blood still remains in the circulation and the circulating blood volume is increased. However the gum solution dilates the vessels more or less and differs from blood in its physicochemical structure. It displaces the blood present in the circulation which necessarily results in a decrease of the circulating blood volume but especially of the erythrocyte volume. The author has shown experimentally that the spleen plays a predominant part as blood depot in the regulation of the blood volume and from this it may be assumed that the spleen plays a predominant part during blood transfusion or the infusion of gum solution into the circulation in the process of overcoming the excess of blood or gum solution. In the author's experiments, the effect of blood transfusion or infusion of gum solution in splenectomized rabbits on the circulating blood volume, plasma volume, and erythrocyte volume as compared with similar results in normal rabbits.

When excessive amounts of blood are injected into the circulation of normal rabbits, small part of the added blood, although mostly deposited in the blood reservoir remains in the circulation and necessarily results in an increase of the circulating blood volume. The fact that simultaneously the relationship of the plasma volume and erythrocytes is thrown out of balance (relative increase of the latter) indicates that simultaneously with the deposition of the blood part of the blood fluid streams into the tissues. This is an expression of the accommodating capacity of the organism to protect the heart from overload with excessive blood.

Similar experiments on splenectomized rabbits showed that because the organism deprived of the spleen blood reservoir no longer has the capacity of storing excessive blood the regulation of the blood volume is insufficient.

The infusion of gum solution in normal rabbits showed that the infused gum solution forces greater amount of blood, together with the erythrocytes, into the blood reservoir and remains in the circulation in place of the displaced blood. In this way

the relationship between the amount of plasma and erythrocytes in the circulating blood, in spite of the decrease of the circulating blood volume, undergoes a change, which expresses itself in an increase of the former and a decrease of the latter

In splenectomized rabbits it was found that the infused gum solution forces a larger amount of blood together with the erythrocytes into the blood depots and remains in the circulation in its stead, and that with the absence of one of the blood depots into which the blood should be forced (the spleen), the amount of blood displaced is considerably less than when the spleen is present. Also the increase of the weight unit corresponding with the amount of plasma is greater than in the presence of the spleen. The fact that the erythrocyte volume does not decrease as much as in normal rabbits is indisputably attributable to the absence of the spleen, into which the erythrocytes should be forced.

Consequently much attention should be paid clinically to the condition of the spleen when a blood transfusion is to be undertaken. If, for example, a blood transfusion would be done on a splenectomized patient without due consideration in this respect, it would result in an excessive load on the heart as a result of a rapid increase in the amount of blood. When an infusion of gum solution is made, the blood is forced into the blood reservoirs and also decreases in amount because the spleen is a predominant blood depot. LOUIS NEUWELT, M D

Strumia, M M, Wagner, J A, and Monaghan, J F. The Intravenous Use of Serum and Plasma, Fresh and Preserved. *Ann Surg*, 1940, 111: 623

The authors observe that although the number of contributions on this subject has greatly increased in the past few years, the intravenous use of serum and plasma in place of whole blood is not new. The purpose of this report is to emphasize the simplicity of preparation and the safety of the use of serum and plasma as compared to whole blood, and to make certain comparisons with the use of serum, both fresh and preserved.

The blood is collected in a closed system, a 2 per cent citrate solution in saline in the proportion of 100 c cm for each 500 c cm of blood being used as an anticoagulant. The blood is collected with a rather large needle and the aid of slight suction into a liter pyrex flask that contains the citrate saline solution. The plasma is separated by centrifuging the citrated blood for about one half hour at high speed. The average yield of plasma is a little over 50 per cent of the citrated blood employed, not including the added citrate saline solution.

In the experience of the authors, it is not necessary to type the citrated plasma prior to intravenous administration. In over 1,500 administrations, there was complete safety and absence from reactions. A very important feature is that it can be given in very large and repeated doses. The plasma is diluted with equal parts of saline or saline glucose solution and administered from 5 to 10 c cm per minute. If

the bulk of fluids is to be limited, undiluted plasma may be administered safely.

It may be accepted as a fact that the intravenous administration of serum, fresh or preserved by the lyophile process, is often followed by severe reactions. These reactions were not encountered when citrated plasma, separated by centrifugation, was employed, fresh or preserved either by refrigeration or by the lyophile process. It is assumed that the difference is brought about by the process of fibrin precipitation.

In the ordinary type of hospital the lyophilizing of plasma is not necessary, because of the fact that plasma keeps well under ordinary conditions of refrigeration (about 4°C) for several months, except when used for its prothrombin and complement content. The content of specific antibodies in the plasma remains unchanged for at least thirty-two days, the complement activity begins to decline only after the third and fourth week. The period of useful survival of prothrombin was found to be from one week to ten days. Plasma preserved at 4°C has been employed successfully after forty days in the treatment of secondary shock and various forms of hypoproteinemias. It is presumed that blood plasma can be preserved by refrigeration for much longer periods of time. Plasma has been kept for from three to four months in the frozen state, and then employed intravenously without reaction.

HERBERT F THURSTON, M D

Downman, C B B, Oliver, J O, and Young, I M. Partition of Potassium in Stored Blood. *Brit M J*, 1940, 1: 559

In blood stored according to current British Medical Research Council specifications the plasma potassium concentration rises rapidly during the first week to from five to ten times the initial level, thereafter the rise is comparatively slow. The source of this potassium is the red cell, from which it is liberated quite independently of hemolysis. At room temperature the plasma potassium concentration rises much less rapidly, reaching only 44 ± 7 mgm per 100 c cm in six days. Reduction of the volume of diluent, absence of foreign salts, increase of oxygen tension, or storage at 38°C did not reduce the rate of redistribution of the ion.

The present results show that the total amount of extracellular potassium in M R C bottles stored at from 2° to 4° C may be from 0.2 to 0.4 gm within one week. This change is much greater than any other yet demonstrated in blood during the first two weeks of storage, and, whatever the clinical interest, it provides one useful index for comparing different methods of preserving blood for transfusion purposes.

It is known that potassium salts are toxic when administered in large amounts, the ion affecting particularly the cardiovascular system, for example, Thomson (1939) has recorded pronounced changes in the electrocardiogram when potassium salts were administered per os. There is, however, no clinical

evidence that the amount of potassium likely to be available in the volume of blood generally used for transfusion would be sufficient to produce toxic manifestations. Indeed, the presence of toxic symptoms in cases receiving large volumes of stored blood suggest that the repartition of potassium may be of minor clinical importance only.

The desire to find means of limiting or preventing the repartition of potassium is only partially realized. The movement of the ion is considerably less at room temperature but the possibility of infection is much increased and introduces an undesirable complication unjustifiable in practice.

J THOM WELL WIDENSPÖÖ, M.D.

Flacher R., Allalay E., and Hochstatter J. Preserved Blood; the Effect of Blood Treated with Sanguostat in Mammal Hemorrhage (Sang conservé. L'action d'un sang conservé sur les hémorragies mammaliennes). *Rev Méd de la Suisse Rom.* 94, p. 57.

Flacher and his associates have previously reported on the value of preserved blood for clinical use. They have recently studied a new thrombolytic, sanguostat for the preservation of blood. Animal experiments have shown that severe hemorrhage may cause death by causing necrosis of the nervous centers or by causing "true" anemia due to too great deficiency of the red cells. The latter form of fatal hemorrhage is rare. If, however, even if hemorrhage produces syncope it is not necessarily fatal, as there are considerable reserves of blood in the human body. The serums and their substitutes for blood employed in the treatment of shock due to hemorrhage are of value because they mobilize these reserves.

In experiments on rabbits the effect of blood preserved with different anticoagulants was studied in the treatment of symptoms produced by bleeding. In order to avoid sudden cerebral anemias, the animals were bled with the head down. The carotid pressure was repeatedly recorded during the bleeding. In some experiments the preserved blood was injected when the pressure fell to 15 or 20 mm. In others the bleeding was continued until convul-

sions occurred and the animal, as in the death agon. In a third series of experiment the preserved blood or fresh blood was injected when the carotid pressure fell to 20 mm. Then the normal blood again till the pressure fell to zero, convulsions developed, and the heart in fibrillation then fresh blood or preserved blood was injected again. It was found that preserved blood treated by various types of thrombolytics could save the life of the animal when near the death agon. If given when the pressure falls to 20 mm and the animal was in collapse, much smaller quantity of blood was required. If such a large quantity of blood had been withdrawn that the life of the animal could not be saved by the injection of preserved blood, it was also found impossible to supply the blood loss and revive the animal with the transfusion of fresh blood.

With sodium citrate or heparin as an anticoagulant preserved blood is not effective if it has been preserved more than eight days if sanguostat is used.

The anticoagulant, it is effective if preserved for fifteen days. The amount of blood necessary also varies with the anticoagulant used. Too large quantity of preserved blood should not be employed in the treatment of massive hemorrhage. This is true also of fresh blood, as large amounts may cause death by block or embolism. The quantity employed should be just sufficient to raise the blood pressure to a satisfactory level. In a case reported, an injection of 50 cc. of preserved blood treated with sanguostat was sufficient to raise the blood pressure and bring the patient out of coma after internal hemorrhage. This patient died later because of a generalized thrombophlebitis. The preserved blood is of value not merely to supply the blood loss but because it mobilizes the reserve supplies of the body. In cases of severe hemorrhage the transfusion of preserved blood is effective, that of fresh blood is overcoming shock and syncope and raising the blood pressure if the hemorrhage continues. The injection of preserved blood raises the pressure sufficiently until large transfusion can be given and the patient prepared for any operation that may be necessary.

WILLIAM M. M. M.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE, POSTOPERATIVE TREATMENT

DeTakats, G., and Jesser, J. H. Pulmonary Embolism *J Am M Ass*, 1940, 114 1415

A large collected series of cases of pulmonary embolism reveals a fairly steady incidence in large services, namely from 0.1 to 0.2 per cent of all operations, 2 per cent of all deaths, 6 per cent of postoperative deaths, and about 10 per cent of all autopsies. In the present report the authors confine their remarks largely to observations on the value of early diagnosis and the employment of simple procedures which may reduce the incidence and high mortality. In a series of 100 cases which showed undoubted evidence of thrombophlebitis or hemoptysis, roentgen evidence of infarction, or were proved at autopsy, there were 25 medical cases, 74 surgical cases, and 1 obstetrical case. Of the medical patients 18 had heart disease, and 33 treated surgically had been subjected to pelvic laparotomy.

The initial signs and symptoms most frequently noted were dyspnea, chest pain, cyanosis, weak, rapid pulse, shock, and restlessness. Abdominal symptoms suggesting acute cholecystitis or ruptured viscus were observed. Likewise cerebral anemia signified by convulsions or vertigo were frequent. The conception that the survival time following pulmonary embolism is too brief to institute therapeutic efforts is erroneous as shown by the fact that in the group of 70 fatal embolisms 85 per cent of the patients died in less than ten minutes, roughly 60 per cent lived more than one hour, and 34 per cent lived from one to several days.

Of the precipitating factors most commonly noted, bowel movement and active or passive physical exertion head the list, but in 70 cases no obvious precipitating factors could be elicited and in these possibly physiochemical changes played important rôles.

Eighty seven patients in this series died, while 13 recovered. A large number had more than one infarct, and the authors estimated that a patient who survived one pulmonary embolism had a 40 per cent chance of having another one, but if he survived the second he would have only a 12 per cent chance of having any more.

On the basis of experimental observations the authors believe that a widespread radiation of autonomic reflexes occurs during pulmonary embolism which may contribute to the causes of death. The vagus constricts the smooth muscles of the coronaries, the bronchi, and the upper gastrointestinal tract. It is suggested that atropine be used to block the vagus impulses and papaverine to relax the contracted smooth muscle.

Factors predisposing to postoperative thrombosis are increase in the number of platelets which occurs

following any major operation and reaches its peak between the eighth and eleventh days, increase in the fibrinogen, a shift of the albumin-globulin ratio in favor of the globulins, and an increase in blood viscosity. The increase in platelets and leucocytes results in liberation of thrombokinase and hastens the coagulation of stagnating blood adjoining an obstructing platelet thrombus.

The importance of clean, sharp dissection and avoidance of undue trauma to the tissues is stressed. Other factors to be considered are age, overweight, and operations on the lower part of the abdomen, pelvis, and the lower extremities. Too little attention has been paid to counteracting the marked retardation of the blood flow which occurs after every major operation and after childbirth. The veins of the pelvis and lower extremities are the most favorable sites for stasis. Immobilization in bed, superficial breathing, intestinal distention, tight abdominal binders, and motionless rigidity due to postoperative pain are all factors which interfere with venous backflow. Various means have been described to improve the circulation, and among these are exercises of the legs, turning the patient from side to side, deep breathing exercises, administration of thyroid extract, digitalization of the failing heart, and the postoperative Trendelenburg position. The authors find the latter a worthwhile adjunct except when intra-abdominal supuration or cardiac failure contraindicates its use. They have also found that the use of a set of mounted bicycle pedals used for five minutes three times a day aids the return venous flow.

It must be recognized that a correct diagnosis is not always made, and only measures which would do no harm even if pulmonary embolism is not present should be used. When cyanosis and dyspnea are predominant oxygen is indicated. One hundred per cent oxygen administered with the BLB mask is preferable. In the syncopal type of embolism, characterized by pallor, fall in the blood pressure, and retrosternal pain without cyanosis, papaverine and atropine are advocated. Both drugs are given intravenously and it is desirable to dissolve the drugs in saline just before administration. Papaverine is given in doses of $\frac{1}{2}$ gr (0.03 gm) and atropine in doses of from 1/60 to 1/75 gr (from 0.001 to 0.008 gm).

The successful removal of the obstructing plug in the pulmonary artery has been possible only 9 times in 132 attempts, and recently Pilcher has suggested that the slowly dying patients might be operated on two or three hours after the onset of the symptoms while not in a moribund state but showing no improvement. Another surgical procedure is suggested which entails the removal of a recognizable localized clot in one of the iliofemoral veins through the saphenous vein.

JOHN A. GRUS, M.D.

ANESTHESIA

Hediger, E. M., Chenoweth M. B., and Gold, H.
The Use of Bulk Ether in Surgical Anesthesia.
J. Am. M. Ass. 1924, 24, 122.

The belief prevails that U.S.P. anesthetic ether deteriorates very quickly and is unfit for anesthesia twenty-four hours after the container is opened. It has previously been reported that this view is based on misconception, and further clinical and chemical studies now reported show that ether does not deteriorate nearly as quickly as is commonly supposed. If the sealed metal container in which anesthetic ether is supplied is opened and the container stoppered with cork repeatedly, the ether remains pure for many weeks. Cork which may fall into the ether or air which may gain access to it exert no appreciable influence on the speed of its deterioration. In a series of nearly 2,000 surgical anesthetics in which ether was used it was found that ether from cork-stoppered anesthetic ether cans was indistinguishable clinically from ether in sealed metal containers.

From these findings the authors conclude that hospital may use bulk ether for anesthetic purposes without compromising the purity of the ether or the safety of the patient. A considerable saving in the cost of ether can thus be effected.

JOHN A. GIRA, M.D.

Popoff, A. F. Experimental Fractional Spinal Anesthesia. *Lancet* 1924, 90, 91.

With the usual technique of spinal anesthesia the concentration of the drug introduced into the spinal canal may be insufficient in some cases while in others an overdose may produce serious symptoms. An individual dose can be properly selected only if the fractional method of injection is used. The author employed this method in 50 cats.

After urethane anesthesia laminectomy was performed to allow an introduction of the anesthetic solution into the spinal canal under eye control. The blood pressure and respiration were recorded with the technique customary in animal experimentation. A 1 per cent novocain solution used for spinal anesthesia as introduced in 7, 8, or 9 equal or rising doses in the lumbar segment of the spine. After the introduction of the first fraction the blood pressure became stabilized and responded less to repeated injections. In this manner total dose of the anesthetic from 5 to 9 times as large as a single fatal dose was well tolerated. An addition of ephedrin increased the tolerance still more. A prophylactic injection of ephedrin diminished the fall of the blood pressure following the first injection of the anesthetic and stabilized the tone of the blood vessels.

The fractional method of spinal anesthesia eliminates the shock of the nervous system provoked by

the customary single injection of a large dose of the anesthetic solution. Furthermore dangerous symptoms can be noticed sooner when the fractional method is employed. Among fatal sequelae of the spinal anesthesia, the disturbance of respiration occupies the main place and it is therefore important that the attention of the anesthetist be concentrated on observation of the respiration.

JOSEPH K. NARA, M.D.

SURGICAL INSTRUMENTS AND APPARATUS

Evstropoff, A. P. Parietal Catgut. *New York* 1924, 45, 94.

Numerous publications describe difficulties encountered in perfect sterilization of common catgut and therefore search for less infectible absorbable material is fully justified.

Kuznetsov introduced so called neocatgut prepared from the serous membranes of the bovine cecum. The serosa is removed from the gut after its eversion, care being taken to avoid any incision into the lumen of the intestines. However the rapid multiplication of the intestinal flora post mortem may be responsible for contamination of the inner layer of the serosa. Therefore, the author of this article prefers the use of parietal peritoneum. Strips of it 60 by 80 cm. are cut out after preliminary removal of the abdominal contents without opening of the intestinal lumen. The peritoneum, removed together with the peripitoneal fascia, is placed for at least twenty-four hours in a 1 per cent aqueous formalin solution. After that the strips are washed in running water for from ten to fifteen minutes and spread on glass. The peripitoneal fascia is separated from the peritoneum within the area of the elastic reticulum. The remaining tissue, 1 to 3 mm. thick, is divided into strips from 1 to 3 cm. wide which are braided and dried under tension. After twenty-four hours they are ready for use.

Laboratory studies of dry and wet parietal catgut showed that the variations in the diameter of the dried material are on an average one-half times as great as those of the common catgut, while the diameter of the wet catgut remains more uniform. The tensile strength of parietal catgut is one and one-half times less than that of common catgut. The resorption of the new material is twice as slow as that of the intestinal catgut. This is a great advantage because the strength of an intestinal catgut sutures diminishes on the third to sixth day while the parietal catgut retains its strength for from nine to twelve days. After sterilization according to Claustron's method parietal catgut becomes elastic, knots can be tied easily and the suture material is not slippery. Intestinal catgut. The preparation of the new type of catgut requires only one to two days.

JOSEPH K. NARA, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Oppenheimer, A *The Ileocecal Region Radiology,*
1940, 34 545

Since 1928 the author has observed the ileocecal region systematically in routine examinations whenever possible and published some of his observations in previous papers. The present report is confined to an analysis of records obtained in 86 persons, apparently healthy. Special attention was given to the following questions:

1 How is the food moved on from the ileum into the cecum?

2 How does the food ascend through the cecum and proximal colon?

3 Is there any correlation between this kind of peristalsis and the passage of food through the ileocecal valve?

4 Does the ileocecal valve control the passage actively, by sphincteric contractions, or does it merely yield to pressure, like a valve?

The methods employed in the study are described briefly. Observations were made at varying intervals after an opaque meal of the terminal ileum, cecum, ileocecal valve, cecocolonic sphincter, and appendix, and the findings are recorded in detail. The results are summarized as follows:

1 Both in the terminal ileum and in the cecum and ascending colon, opaque food is moved on chiefly by "systolic" tonic contractions which are preceded by "diastolic" relaxations due to loss of tone. The tonic variations are fairly rapid in the terminal ileum, but very slow in the ascending colon, in the latter, the caudad progression of the haustra helps to carry the food upward as though by a dredging device.

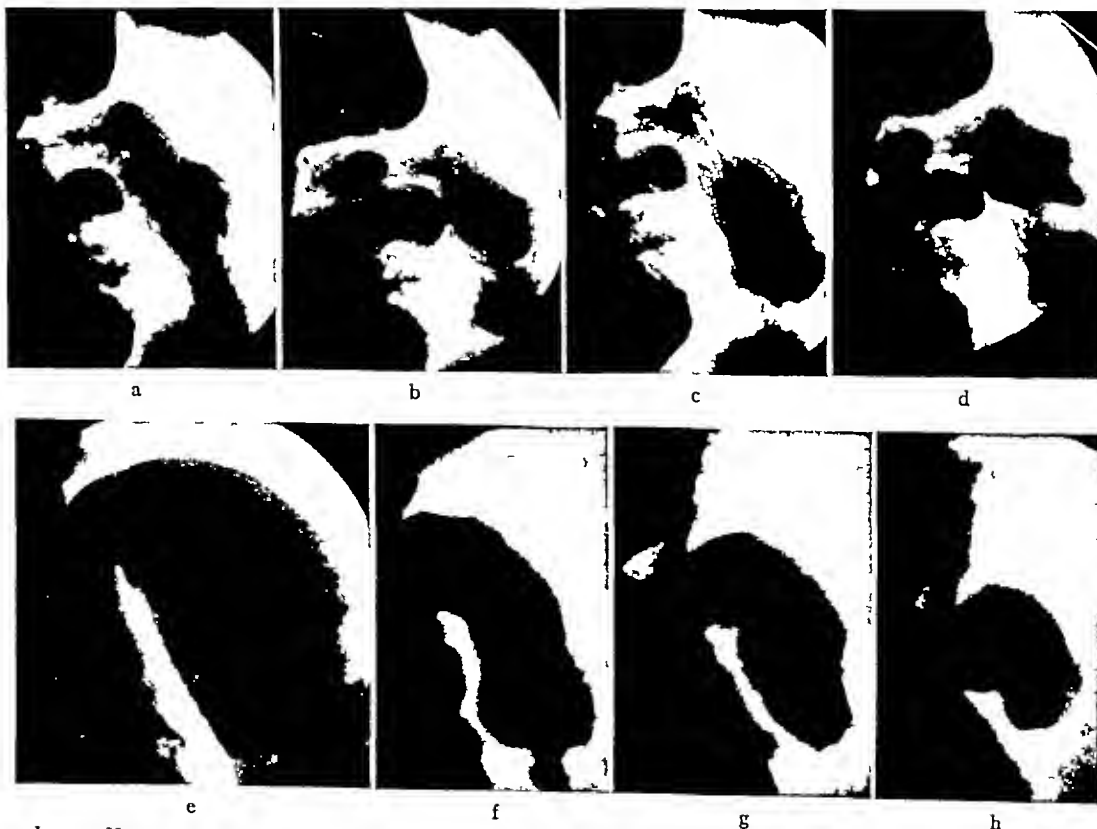


Fig 1. Upper row 1 a through 1 d rhythmic peristalsis in terminal ileum, ileocecal valve closed, no barium enters the cecum. Lower row, 1 e through 1 h after a sudden relaxation (1 e) the terminal ileum is emptied by one single

stripping contraction (1 f through 1 h). Spot films taken at intervals of from seven to nine seconds. The two series show that food is moved on into the cecum by means of changes in tone, but not by rhythmic peristalsis.

2. Rhythmic peristalsis does not move the contents appreciably unless it occurs as a stand-by mechanism.

3. A "receptive relaxation" of the cecum begins soon as opaque food reaches the ileal loop proximal to the terminal loop.

4. The cecum is normally low in position when it begins to fill, and rises while the contents are moved on into the transverse colon.

5. The ileocecal valve remains closed while peristalsis in the terminal ileum is a-shaped and rhythmic. It becomes passable when the opaque medium is driven forward by tonic "stripping" contractions in the terminal ileum. The valve is normally competent if opaque food given by mouth.

6. The cecocolonic sphincter is relaxed while the ascending colon fills but contracts strongly while mass peristalsis drives the contents into distal parts. This contraction causes a physiological stasis in the cecum.

7. The vermiform appendix is filled by the peristalsis of the cecum but is emptied by its own intrinsic tonic contractions.

WOLFE HARTMAN, M.D.

Tod M. C. The Treatment of Metastases. *Brit. J. Radiol.* 940, 3, 63.

Radiotherapy for metastases differs according to whether treatment can be expected to cure or only to palliate the symptoms. Curability depends greatly upon whether the neoplastic cells have reached the site of secondary deposit by lymphatic or hematogenous spread. In the case of lymphatic spread, areas likely to be involved can be foretold with some certainty and treatment of these areas in limited regions where curative dosage is possible may result in destruction of such cells and may prevent dissemination. It is impossible to forestall the appearance of blood-borne metastases either before they appear or after the detection of a solitary deposit so treatment must generally be palliative.

Curability also depends largely upon the radio-sensitivity of the particular neoplasm. A biopsy diagnosis is usually necessary to determine this sensitivity but it may be estimated either by giving small doses to the whole lesion or larger doses to small parts of the tumor and watching the effect. Metastases from two groups of tumors are susceptible to curative therapy: highly radio-sensitive tumors which call for treatment of large volumes at low dosage, and tumors of limited sensitivity group which includes the malignant squamous-cell carcinoma and most of the carcinomas of the breast. These must be treated with higher doses and, therefore in small volumes. Treatment of metastases from resistant tumors such as the sarcomas of adult tissue is never curative.

The following conditions are listed as probably being highly sensitive:

Tumors of embryonal origin

Seminoma testis

Frst embryonal tumor of the ovary

2. Primitive tumors of unknown origin
 - Wilms tumor of the kidney
 - Some tumors of the thyroid glands
 - Some tumors of the salivary glands
 - Some tumors of the nasopharynx and nasal accessory sinuses

3. Conditions of reticulo-endothelial origin
 - Leucemia
 - Hodgkins disease (lymphadenoma)
 - Lymphosarcoma (reticulosarcoma)
 - Thyoma
 - Ling tumor
 - Endothelioma of vascular origin
 - Miscellaneous reticulo-endothelial diseases

The property of including in this list some of the reticulo-endothelial which are generalized diseases is discussed briefly.

As regard the method of treatment in regional therapy for tumors of high sensitivity the aim should be to deliver to the whole region likely to be involved, doses of radiation which would produce lethal to the tumor without exceeding the general tolerance. Detailed information and diagram illustrations are included to exemplify the method used. Blood counts are considered essential as an index of the general tolerance. The development of radiation sickness is discussed and means for its avoidance or reduction are given consideration.

Localized therapy for metastases from tumors of limited sensitivity is essentially a question of dose. The common accessible tumors nearly all belong to this class, and experience has proved that when an attempt is made to cure squamous-cell or columnar cell carcinoma, certain minimum doses must be utilized if there is to be any hope of success. The dose required is such that the volume of tissue which can be treated is strictly limited by local tolerance. Operable metastases from such lesions should preferably be treated by operation.

For palliative therapy of metastases, the following techniques are listed and discussed at some length.

Localized therapy for single deposits of sensitive neoplasms when more foci are known to be present.

2. A growth-restraint technique for resistant tumors.

3. A chewing technique which treats individually series of secondaries as they appear.

4. Symptomatic palliative therapy.

WOLFE HARTMAN, M.D.

Den Hoed, D. The Supervoltage Roentgen Installation in the Antoni van Leeuwenhoekhuis Amsterdam. *Acta radiol.* 940, 3.

An ever-increasing number of roentgen therapeutic apparatuses operating at tensions of from 200 to 600 kV are being built and recently apparatuses operating at tensions up to 1,000 kV (the approaching the penetrating power of the radium rays) are being built, especially in America. In connection with such installations, particular attention must be paid to new physical and biological problems.

1 A study of the physical problems leads to the conclusion that the supervoltage roentgen therapy is more advantageous than the deep roentgen therapy because of (a) the greater penetrating power of the rays, (b) the greater depth dose in water, (c) the possibility of using smaller fields in practice, (d) the smaller volume-dose, (e) the flatter isodose curves, (f) the higher output of radiation, and (g) the change of quality in deeper layers. However, the importance of the last is questionable.

2 The biological advantages are that comparatively larger surface doses may be administered to obtain the same erythema than with deep roentgen therapy, and that thus there is less damage to the skin. It also appears that the efficacy of the irradiation as a whole is greater.

Recently the author has installed at the Antoni van Leeuwenhoekhuis a supervoltage roentgen-therapy apparatus which theoretically is capable of operating at 1,200 kv, but which for the sake of safety is being run for the time being at 850 kv. The principles of this apparatus as well as the arrangement of the treatment room are briefly discussed.

The high-voltage source consists of a cascaded type generator of the Greinacher, Cockroft, and Bouwers circuit, with one end grounded. The valves are oxide cathode gas-filled rectifiers, requiring only 8 watts of heating energy.

The roentgen tube is three sectional, the individual sections being soldered together after separate outgassing. The partitions, composed of con-

stantan foils, are permeable to the electron beam. Each of the sections can withstand a tension of 400 kv, so that the tube is designed for 1,200 kv. The filament is at one end of the tube fed by batteries, and the target at the other end. The electron beam is focused on the target by means of several electromagnets at various points along the tube. One of the essential features of construction is the fact that several reservoirs of "getters" chemical compounds, which have a strong absorbing power for gases, are fitted within each section of the tube. When gas is formed at the time of the original sealing or later during the long run of the tube, the electric explosion of a "getter" restores the vacuum within a short time.

The entire generating plant is mounted in a cellar which is 5 meters deep, 8 meters long, and 5 meters wide, in order to insure satisfactory protection. Apertures are provided in the ceiling for the simultaneous treatment of 3 patients, who are placed in a room on the ground floor on couches with parallel longitudinal axes. The walls of the treatment room, as well as the control cabinet are heavily protected with barium concrete and lead screens.

The output of the roentgen tube was measured as 6.7 roentgen min at 125 cm distance with 825 kv, 2 mm copper, $\frac{1}{2}$ mm tin and $\frac{1}{4}$ mm aluminum as filters and 0.9 ma as tube current. The half-value layer under these conditions proved to be 5.9 mm of copper.

The clinical results will be reported in subsequent articles.

T. LEUCUTIA, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Uggeri, C., and Rosol, B. A Contribution to the Study of Subcutaneous Sarcoma (Contributo allo studio della sarcoma ipodermica) *Clin. chir.* 940, 26 263.

Of the numerous classifications of cutaneous sarcoma, the most often cited are those of Perrin and Unna as the most generally accepted. Perrin classifies sarcomas into primary and secondary. The primary group comprises Kaposi's type, Perrin's type, and an atypical or intermediate form. The secondary cutaneous sarcomas, which originate from warts, moles, healthy skin, or other organs, are progressive in growth and have variable clinical and histological character. The survival period in this latter type seldom exceeds two years. The authors, however, prefer the classification of Unna into regular sarcoma (idiopathic sarcoma of Kaposi and melanotic sarcoma) and irregular sarcoma types described by Pifford, Unna, Perrin, Neumann, Funk Hyde. These various types are briefly described.

The authors describe a case of subcutaneous sarcoma developing in a sixty-five-year-old farmer about one and one-half months following recovery from an attack of influenza. There was a mass about the size of a pigeon's egg on the lower lateral side of the left hemithorax. Within seven weeks the mass increased rapidly in size and another developed beneath and anterior to the first, ovoid in shape, about 7 by 8 cm. in size, and reddish gray in color. The mass was slightly mobile, hard, and parenchymatous in consistency and caused slight pain on pressure. The entire mass including the skin was excised and the wound healed within twelve days.

Several days after operation, numerous similar nodules (about 100) appeared on the trunk and neck. The roentgen-ray examination revealed the absence of visceral involvement. Intense arsenic therapy had no effect. Irradiation therapy had slight effect but did not reduce the size of the nodules. The patient's general condition gradually became worse and he died about four and one-half months following operation. Histological examination demonstrated a polymorphous cellular sarcoma, with a predominance of spindle cells.

The authors cite 4 cases in the recent literature which were similar to their case. These cases were characteristic of Perrin's type regarding the location, distribution, and clinical course, but histologically they differed in that most of the cells were spindle-shaped instead of rounded.

The authors point out that the origin of these tumors is still a controversial subject. The various organs that have been considered, i.e., fibroblastic, neurogenic, vascular and endothelial, are reviewed.

The authors concluded that the sarcoma in their case was probably of reticular or histiocytic origin.
MICHAEL DEBARRY, M.D.

Kantagati F. Sarcoma of the Reticulo-Endothelial System (Il Reticosarcoma) *Tumori* 910, 26 43.

Radiologists have recently been devoting more attention to the tumors of the reticulo-endothelial system, especially those involving the lymphatic tissues. Of particular interest has been the group of reticulo-sarcomas.

The author reviews the literature of reticulo-sarcoma from the time of Virchow down to the present. He reports on 53 cases treated since 1918 at the Tumor Clinic of the Milan University. Histologically reticulosarcomas result from the malignant hyperplasia of the reticular elements of the lymphatic glands or tonsils. According to Ewing these tumors form 1.5 per cent of all tumors of the lymphatic tissues.

The author's group of 53 cases was gathered between 1918 and 1930 and consisted of 34 cases of tumors involving the tonsils and rhinopharyngeal region, and 19 cases of tumors localized in the lymph glands elsewhere in the body. Reticulosarcoma appears to be most common during adolescence, the youngest patient was nine years old, the oldest seventy-six years. In the author's series 60 per cent of those affected were males. The tumors are malignant and tended to progress although the degree of malignancy varied in individual cases. The most common localization was in the glands of the neck, pharynx, and tonsils. The author noted that in some of his cases the condition was preceded by an acute tonsillitis or tonsillar abscess. There was a mild intermittent febrile reaction which in some cases led to a diagnosis of tuberculosis or lymphogranuloma. With progressive development of the tumor loss of appetite, asthenia, and cachexia occurred. The blood showed a mild anemia; the white cells were normal or moderately increased; 1 of the author's cases showed the formula of lymphatic leucemia.

With tonsillar localization the patient had the sensation of the presence of a foreign body when swallowing. There were otalgia, dysphagia, and enlargement of the glands in the neck. Deglutition became painful and difficult and the patient forced to take liquid and semi-liquid food. The tonsil was enlarged in volume with infiltration of the tissues in the vicinity.

The differential diagnosis must include consideration of simple hypertrophy, ulcerated granoma, tuberculosis, lymphoid leucemia, and lymphogranuloma. Glandular metastases develop early and in tumors of the tonsillopharyngeal region may be the first evidence of the condition. Metastases have been encountered in the pleura, liver, ribs, vertebral column,

intestine, lungs, vagina, pancreas, kidneys, and adrenal and thyroid glands

As to treatment, the author refutes surgery and favors radiation with the x-rays or radium. The tumors are very sensitive to radiotherapy. For epipharyngeal tumors Zuppingers gives from 3,500 to 4,000 roentgens per field. On the other hand, Eigler and Koch report a case treated with 250 roentgens which remained cured after six years. The author uses from 1,500 to 3,000 roentgens. He also uses from 160 to 170 kv, a distance from 40 to 50 cm, and a filter from 0.5 to 1 mm of copper plus 1 mm aluminum. For the glandular types the author prefers roentgenotherapy to radium. For the epipharyngeal tumors he uses both radium and x-ray treatments. The former is given by means of a tube of 10 mgm of radium in the rhinopharynx with a dose of from 7 to 8 mcd.

A variety of results are reported in the literature. Beck reported 20.8 per cent of his patients cured after three years. The author gives a detailed tabulation of his cases and results. The immediate results of the author's 58 cases were brilliant. 88 per cent showed complete regression of the neoplasm after radiation therapy, while only 12 per cent terminated fatally during the first treatment or shortly after. There were 23 recurrences noted within the first six months after treatment. Of 34 patients in the orotonsilopharyngeal group 18 have died and 16 are still alive. Of 24 patients with conditions of the primary glandular group only 3 have remained free of disease for a period of from one to two years. Of the 19 deaths in the latter group 3 occurred within from twelve to twenty months after the beginning of treatment, 3 after ten months, and all the others in less than six months. In the tonsillo oropharyngeal group there were 6 one year cures (40 per cent), and in the primary glandular group there were one year cures in 25 per cent of the cases. The author comments that in the primary involvement of the lymph glands extraordinary malignant types have been observed.

The author concludes that these tumors represent a definite clinico-anatomical entity, that they occur with relative frequency, and that they are probably identified with the so called lympho epitheliomas. The diagnosis should always be controlled by biopsy, the prognosis should be reserved because of the tendency toward recurrence and metastases, particularly in the primary glandular forms. The surgical treatment of such tumors should be abandoned. Finally, although the immediate results of radiation therapy are brilliant, the later results after one and two years are doubtful.

JACOB I. KLEIN, M.D.

Allen, J. G., and Julian, O. C. The Clinical Use of a Synthetic Substance Resembling Vitamin K. (2-Methyl-1,4-Naphthoquinone). *Arch Surg*, 1940, 40: 612.

The synthetic substance 2-methyl-1,4-naphthoquinone in dosage of 8 mgm per day by mouth rapidly reduced the prothrombin time to normal in 4

cases of obstructive jaundice, 1 case of biliary fistula, 1 of sprue, and 1 of hepatitis, but was completely ineffective in a case of acute yellow atrophy and 2 cases of cirrhosis of the liver. In the last even intravenous injection was without effect. This suggested that in advanced liver disease the process of activation of the prothrombin by the naphthoquinone failed to occur.

PAUL STARR, M.D.

DUCTLESS GLANDS

Gusziel, A. Studies on Serum Lipase in Operations (Serumlipase Untersuchungen bei Operationen). *Orvostételep*, 1939, 29: 322.

The undisturbed state of the thinning of the skin is assured by the lipase and the bile together. The basic principle of the studies on serum lipase was the establishment of the fact that organ-specific lipases penetrate into the blood only in diseases or injuries of very definite organs. In a series of experiments it was intended to determine, not the absolute amount of the serum lipase, but the relationship of the lipase to the blood before and after certain operations. For this purpose, patients of three disease groups were selected, namely (1) those with disease of organs that are distant from the pancreas (the control studies were made forty-eight hours after the operation), (2) those with carcinoma, and (3) those with disease of the stomach, duodenum, and biliary passages, and with acute and chronic pancreatitis.

In summarizing the results of these investigations, the author shows that the operations that were made on organs that were distant from the pancreas did not essentially affect the function of the pancreas. The increase in lipase after operations on the stomach, duodenum, and the biliary passages indicates a transient, organic, and not functional disturbance of the gland, chiefly the result of the mechanical insult produced by the operative trauma. Relatively often pancreatic changes are associated with cholelithiasis and also with diseases of the biliary passages, in these cases the tenderness traceable to the left side (gall stone), and the increase of the serum lipase, should be determined, the latter draws attention to the seriousness of biliary disease.

Patients with cholelithiasis are always exposed to the danger of disease of the pancreas, concerning the prognosis of which nothing definite can be said beforehand. In other words, the symptoms originating from a gall stone may recede with conservative treatment, but a final cure can be expected only with surgical therapy. The gall stone may lead to pancreatitis through mechanical or bacterial means or through reflexes. In addition to a pus producing gall bladder containing bacteria, toxic injury of the pancreas is always probable.

In chronic cases, in which operation (cholecystectomy, opening of an abscess) resulted in an improvement of the disease symptoms a diminution of the lipase values was usually observed. In carcinomatous cases with higher lipase values after a

radical operation tendency to lowering of the lipase also is observed. There is no kind of parallelism between lipase and diastase but the lipase reaction is relatively more sensitive method for the determination of pancreatic diseases. A crisis of the pancreas may recede with expectant treatment, but it is difficult to determine whether in certain cases milder or severer course is to be expected. We do the ferment values give any reliable information regarding the course of the condition. It is possible that in cases that improve on simple bed rest extreme variations of the fermenta may be found while in rapidly progressing severe cases no changes are found. When the diastase content of the urine or the lipase content of the blood is not increased attention must be paid to the blood-sugar content. That sometimes no ferment change is found in severe pancreatic changes is due to the fact that the variation observed in the fermenta is only a very delicate sign (indicator) of the reactionary changes of the organ. It is physicochemical reaction indicating the basic changes of the colloids.

Further conclusions cannot be drawn from the changes in the ferment values abnormally high values indicate pancreatic disease but their absence does not deny it. These results can be evaluated only on the basis of careful clinical observation.

(E. Judd). LECTURE NETWORK MID

Romcoroni C., and Casaroli, A. The Functional Relationship Between the DM Encephalopathy System and the Thyroid Investigated by Means of the Changes Induced in the Basal Metabolism by Spinal Puncture (I rapporti funzionali fra sistema diencefalopituitario tiroide esplorati per mezzo delle modificazioni indotte dalla rachicentesi sul metabolismo basale). *Riforma med.* 1930, 36, 306.

The authors performed experiment on three groups of subjects individually with increased,

decreased, and normal basal metabolism. The experiment included preliminary determination of the basal metabolism of the fasting subject, spinal puncture followed by subtraction of from 1 to 15 c.c.m. of cerebro-spinal fluid, and further determinations of the basal metabolism one-half hour, one hour, and two hours, and twenty-four hours after the puncture in order to find out whether simple puncture of the meninges as sufficient to cause changes in the basal metabolism, the same sequence of event followed in control group, but no cerebro-spinal fluid subtracted after the puncture had been made. Possible causes of error due to the emotional state of the subject are avoided by making basal metabolism determinations on several days preceding the experiment.

Spinal puncture with subtraction of cerebro-spinal fluid regularly caused an increase in the basal metabolism determined one half hour after the intervention. The higher the initial basal metabolism, the more pronounced became the increase. In hyperthyroid subjects, the return to normal of the basal metabolism occurred much more slowly than in subjects with normal basal metabolism. In subjects with decreased basal metabolism, subsequent decrease occurred after initial temporary increase. The metabolic values had returned to their starting point in all subjects after twenty-four hours. Simple lumbar puncture without subtraction of cerebro-spinal fluid did not cause any changes in the basal metabolism.

The authors think that it is possible that simple puncture induces subsequent deviation from the normal in accordance with the metabolic tendency of the individual, and they believe that the spinal puncture acts probably through disturbance of the pressure in the third ventricle which has its repercussion on the diencephalic cells.

RICHARD KENZEL, M.D.

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HEAD

Yosset, G J The Late Results of Surgical Treatment in Compound Fractures of the Vault of the Skull *Vestnik khir*, 1940, 59 117

This article is based on observations of 109 patients with compound fractures of the vault of the skull Twenty-two patients (20.1 per cent) died, while 87 patients (79.9 per cent) recovered Forty of the latter (45 per cent) underwent periodic examinations extending over a period of from one to nine years

It appears that the disability is produced chiefly by cerebral symptoms Contrary to the statements of several writers, epilepsy is not a very frequent complication after skull fractures of 40 patients, only 1 suffered from this condition A series of relatively serious subjective complaints did not interfere with resumption of professional work No close relationship could be established between the intensity of the trauma and the nervous symptoms reported

It must be admitted that the method of examination of late results of skull fractures is far from satisfactory as it is chiefly based on subjective complaints Several new methods of objective study have recently been developed, e.g., determination of the diastolic pressure of the retinal artery, encephalography, and Foerster's iodine test of the spinal fluid, but complicated technique and potential dangers, which are involved are responsible for the lack of popularity of the new examining methods

In a large percentage of cases defects of the skull of various sizes remained after the operation, nevertheless, such defects were apparently not causing great disturbances as plastic operations were usually refused by the patients Osteosclerotic changes could be detected roentgenographically in the regions of bone surrounding the defects

Of 40 patients, including children and invalids, favorable conditions were found in 33, or 82 per cent The statistics show that the results of surgical treatment in compound fractures of the vault of the skull are not as poor as is generally assumed

JOSEPH K. NARAT, M D

Muench, J, and De l'Espine, A Contribution to the Statistics of Maxillary Fractures with Especial Consideration of Fractures of the Articular Process (Zur Kieferbruchstatistik unter besonderer Beruecksichtigung der Gelenkfortsatzfrakturen) *Deutsche Zahn- u. Heilk*, 1939, 6 694.

This report concerns 154 individuals with fractures of the jaw, of whom 85 per cent were men (manual laborers) from twenty to thirty years of age The injuries resulted chiefly from accidents in traffic and industry, only a few from athletics

Eighty five per cent of the fractures were compound, 74 per cent were confined to the lower jaw, 7 per cent to the upper jaw, and 19 per cent involved both the upper and lower jaws In 34 per cent of the mandibular fractures the condyle was broken, in 38 per cent there was a bilateral fracture of the articular process, in 27 per cent of the latter there were fracture dislocations of the capitulum

In spite of numerous, familiar, clinical signs, the diagnosis of fracture of the articular process is to be determined entirely by precise roentgenograms taken in at least two planes The various types of fracture of the articular process and their mode of origin are discussed in detail Three factors are responsible for a fracture dislocation of the head of the mandible the strength of applied force, its direction, and the pull of the masticatory muscles The head of the mandible may be dislocated in 4 directions (1) downward and inward, (2) horizontally, rotated in a 90-degree arc, (3) toward or away from the pterygopalatine fossa, and (4) medially In the treatment of such fracture dislocations, only the large fracture fragment receives attention and the dislocated head is left to shift for itself The main fragment is immobilized by dental splints with intermaxillary elastic traction In 23 per cent of the cases treated, the dislocated mandibular head healed firmly in anatomically correct position, in 17 per cent the position was approximately correct, in 52 per cent there was malunion, and in only 8 per cent did non union result In all cases the function of mastication was completely restored

On the basis of the results described in 15 case histories at hand, conservative treatment is the

method of choice in contrast to the operative procedures.

(BRAND) O. THEODORE ROSSER, J. M.D.

Fontana, G. L. Morphology of the Mixed Tumors of the Salivary Glands (*Morfología de los llamados tumores mixtos de las glándulas salivales*). *Rev. Méd. y Quir.* 1949, 30: 437.

Fontana states that the varied histological structures found in tumors of the salivary glands, and especially of the parotid gland, have led to the belief that the tumors were due to elements belonging to different types of tissue or that they originated from distinct blastodermic layers, hence the term mixed tumors. He reviews the history of these tumors and the theories that have been advanced for their explanation. He has made a personal study of 26 tumors of the salivary glands, all of which belong undoubtedly to the class of mixed tumors.

All authors agree that mixed tumors are by far the most frequent type encountered among tumors of the salivary glands. Mixed tumors are found preponderantly in the parotid gland (87 per cent in the present series) and are nearly always bilateral. They occur principally between the ages of twenty and fifty years (9 cases) and are about equally distributed between the sexes. Chronic inflammation, status of the saliva, and trauma have been mentioned as predisposing factors by different authors. The tumors are of varying size (one of 26 lb. has been reported); they are generally single, but sometimes nodular or multiple. They are encapsulated and easily separated from the surrounding tissues, but they may be adherent to the gland in those when inflammation has superadded. Abscession of the tissues denotes malignant evolution. In addition, through the capsule. They do not compress or invade the facial nerve as long as they remain benign but they may compress the vessels. The occurrence of pain is therefore considered as a sign of malignancy. They are usually round or lobulated and their consistency varies according to their histological composition. Section reveals a smooth surface of grayish white color, myxomatous portions have a brilliant grayish color of vitreous aspect, cartilaginous portions are white and cellular portions are pinker and more banded. The lobules are separated by thin mucous bands which also divide the tumoral tissue into areas more or less irregular round zones.

Examination of the stained preparations shows that the histological forms fall into three great groups: those of epithelial aspect and those of connective tissue aspect. Both are intimately related in the neoplasm. The author gives a detailed description of the tissues; he studies individually the great variety of forms encountered in the tumors, demonstrates the intimate connections existing here between the epithelium and the fundamental substance and concludes that the fundamental tissues derive from the epithelial tissues and that consequently there is only one type of tissue, the epithe-

lial, although it undergoes modification. The only connective tissue present is that found in any tumor.

The author discusses Leroix's classification of mixed tumors and finds it unsatisfactory. He thinks that the tumors should be divided as follows:

Mixed tumors with little intercellular substance and with epithelial predominance which possess great possibilities of evolution. These tumors are more inclined than others to react to any stimulus. The stimulus might be called an adjuvant factor which causes unfavorable evolution.

Mixed tumors with abundant fundamental substance and few epithelial elements. These are tumors which have already evolved and offer less possibility of subsequent unfavorable evolution.

Although the term mixed tumors is inappropriate, the author proposes to keep it because common usage has already imposed it, but it should be used only with the understanding that these tumors are mixed only in their adult morphology and that their origin and evolution are absolutely epithelial.

RICHARD KLEIN, M.D.

EYE

Gifford, S. R., and MacPherson, W. A. A Classification of Vascular Fundus Diseases. *Quart. Bull. Vancouver Univ. Med. School*, 1949, 4: 65.

The importance of routine ophthalmoscopic examinations in cardiovascular renal disease is being recognized more and more by clinicians. Unfortunately there is not always perfect understanding between the internist and ophthalmologist as to the interpretation of ophthalmoscopic findings. Certain descriptive terms and short-cuts in expressions commonly used by ophthalmologists are not familiar to many internists, who are sometimes at loss to evaluate the findings of fundus examination. On the other hand, many ophthalmologists continue to employ the terminology of twenty years ago, which is difficult to reconcile with the recent advances in our knowledge of cardiovascular renal pathology.

The classification employed by the authors is as follows: A, fundus picture and B, renal associated clinical picture.

Group A. Retinal arteriosclerosis

A. Slight to moderate indentation of some vessels by arteries.

Wide arterial reflex in some arteries.

Slight variation in the caliber of the arteries.

No hemorrhages or lipid deposits.

Ratio of arteries to veins about 2:3.

B. Usually slight to moderate elevation of the systolic blood pressure means that early four-hour diastolic pressure rarely below 90, often below 80. The patient is commonly that of benign essential hypertension, but patients are seen with little or no elevation of the blood pressure.

Kidney function and blood chemistry usually normal.

- Patients usually over forty-five years of age
Prognosis relatively good
- Group 2 Retinal arteriosclerosis with retinopathy
- A Somewhat more advanced vascular changes than in Group 1
Some indentation at most of the arterio-venous crossings In addition, there are some patchy hemorrhages and white deposits, usually small and circumscribed
Occasionally thrombosis of the veins or arteries
No diffuse contraction of the arteries
Ratio of arteries to veins about 2:3
- B In general, the same type of patient as in Group 1
Somewhat greater elevation of the blood pressure than in Group 1, but the diastolic pressure is seldom constantly high
Occasional slight changes in the kidney function and blood chemistry, but patients in fairly good health
Vascular accidents or coronary occlusion may occur at any time
Barring such accidents, the prognosis for life is relatively good
- Group 3 Diffuse retinal arteriolar constriction
- A All arteries show definite contraction
Ratio of arteries to veins 1:2, often much less
There may or may not be some indentation of the veins
No hemorrhages or deposits
- B Earliest stage of diffuse angiospastic hypertension
Blood pressure, especially diastolic, usually quite high
Often no changes in the blood chemistry
Younger persons than those of Group 1 and 2
Typical cases seen in very early toxemia of pregnancy
Unless the condition is due to toxemia of pregnancy, in which prompt relief is obtained, patients are apt to go into Group 4 or 5 within a relatively short time
- Group 4 Diffuse retinal arteriolar constriction with retinopathy (hypertensive retinopathy)
- A Vascular contraction affecting all arteries more pronounced
Ratio of arteries to veins often 1:4 or less
Occasional occlusion of small arterioles
Hemorrhages and cotton wool deposits
Localized areas of retinal ischemia and edema
- B Well-developed essential hypertension
Diastolic pressure often constantly above 130
Changes in kidney function and in blood chemistry common
Found in severe or neglected toxemia of pregnancy
Prognosis—poor Most patients are more or less incapacitated and die within four or five years In toxemia of pregnancy this prognosis does not apply
- Group 5 Diffuse retinal arteriolar constriction with neuroretinopathy (hypertensive neuroretinopathy)

A Same changes as in Group 4, also edema of the optic discs and surrounding retina The elevation may be as marked as in choked disc, but changes in the arteries usually allow a distinction from the condition resulting from increased intracranial pressure

Macular star frequent

Occasional detachment of the retina, especially in severe toxemia of pregnancy The so-called albuminuric retinitis belongs to this group or to Group 4 Exceedingly high blood pressure and usually marked changes in kidney function and chemistry

Prognosis—very grave Eighty per cent of the patients die within one year (Wagener) In toxemia of pregnancy this prognosis does not apply

SUMMARY

1 A tentative classification of vascular fundus diseases is presented

2 This will be subject to revision after a large series of cases has been followed up for a number of years, and when more accurate data as to the prognosis and associated clinical findings of cases placed in the various groups are available

3 The classification attempts to separate cases with localized vascular changes associated with benign hypertension (Groups 1 and 2) from those showing diffuse angiospasm with or without retinopathy and neuroretinopathy (Groups 3, 4, and 5)

4 The difficulties and inaccuracies of this or any other system of classification are discussed and some possible practical advantages of the present one are suggested

LESLIE L MCCOX, M D

EAR

Kirkham, H L D The Use of Preserved Cartilage in Ear Reconstruction *Ann Surg*, 1940, 111: 896

The reconstruction of ears, either partial or total, has long been an unsatisfactory branch of plastic surgery because of the difficulty in securing a light, thin reproduction of the ear cartilage The use of heterogenous ear cartilage depends on whether cartilage remains as such or is converted into fibrous tissue Rib cartilage preserved in the abdominal wall during plastic procedures remains permanently as cartilage Experimental transplantations of cartilage from the ear of a killed rabbit to the abdominal wall of another rabbit were carried out at hourly intervals up to seven hours after death Cartilage preserved on ice, two pieces dry and two pieces in Ringer's solution, were transplanted at twenty-four hours and forty-eight hours On removal and study six months later all were intact except the iced pieces which showed the morphology of cartilage but death of the cells Cartilage removed from the human ear shortly after death and transplanted to the abdominal wall of another individual was palpable one

year later but was never removed for study. Cadaver cartilage or autogenous cartilage, if the amputated piece is available, can be preserved in aqueous methanol solution and saline (4) for an indefinite time.

I. Transplantation of a type of the types of preserved cartilages, small perforations in the cartilage (3) help to anchor it in place. Usually the operation is divided in five stages. At the first stage the cartilage is planted beneath the skin of the mastoid area through a curved incision in the hair line. I. About 1 month the cartilage and skin are raised and brought forward the underlying raw surfaces being covered with a thin split-graft. A double pedicle tube flap is made, in the neck, of suitable size and length. Three weeks later this flap is transferred to the edge of the new ear, attached so that it forms a helix. After second three weeks the pedicle is returned to the neck or amputated. A tragus is formed by infolding a flap of skin on itself and covering the raw surface with a free graft. This procedure has been used for several years with satisfactory results.

The author presents photomicrographs of human and rabbit cartilage removed after being buried in the abdominal wall for varied periods of time. He also presents diagrams and an illustrative case of partial reconstruction of the ear.

BRAUNFORD CANNON, M.D.

Lempert, J. Endaural Fenestration of the External Semicircular Canal for Restoration of Hearing in Cases of Otosclerosis. Summary Report of 120 Cases. *Arch Otolaryngol* 94, 3, 7.

The fenestration technique advocated by Lempert for the permanent restoration of practical physiological hearing in cases of otosclerosis is an endaural, plastic reconstruction of the auditory mechanism for the creation of a new air-conduction apparatus. It consists of (1) creation of a troughlike fenestra of specified length and width in the bony capsule of the external semicircular canal with the aid of polishing and burnishing burs and (2) the incorporation of this newly created fenestra in the external semicircular canal, which is to assume the function of the fenestra ovalis, within the confines of newly reconstructed air-filled and hermetically sealed tympanic cavity.

That hearing can be improved by fistulization of the semicircular canal has been known for many years. The problem of maintaining the improvement, however, as technical one requiring solution. Because the anatomical structures involved are minute and do not permit great latitude in handling only those who will take cognizance of the great importance of fine details of technical minutiae in the solution of this problem can expect to be rewarded by the long-awaited successful results. There is no doubt that simpler and less complicated technique ought to be developed to improve hearing in patients with otosclerosis; however, since one of the essentials of any technique developed will be the creation of

fenestra in the bony capsule of the labyrinth, the technique for the improvement of hearing will remain one of the most delicate and most difficult of accomplishment. In order to create the kind of fenestra which will result in permanent maintenance of the maximum degree of improved hearing obtainable on the operating table the greatest amount of delicacy is necessary and the operation will always tax to the utmost the patience and skill of an otologist.

Fenestration is indicated (1) when the loss of hearing is bilateral and progressive, (2) when the stapes within the fenestra ovalis is fixed but the membrane of the round window has remained normal, (3) when the hearing in the conventional frequencies has declined to a level which makes practical hearing of conversation impossible, (4) when the hearing by bone conduction for these frequencies has remained normal or has declined to a level not lower than 3 decibels, (5) when the tympanic membrane is normal and completely intact, (6) when there is complete absence of infection in the middle ear, (7) when the ossicles are patent and (8) when the patient is in normal state of health.

The fenestration operation has been performed by the author in 120 cases within the past 3 years. Permanent restoration of practical physiological hearing resulted in 60 cases. The 60 patients are now socially and economically rehabilitated. Marked improvement in conventional hearing resulted in 10 cases. Further impairment of hearing resulted in 5 cases. The hearing remained unimproved in 7 cases. In every case in which permanent restoration of practical physiological hearing as obtained after fenestration, tinnitus completely disappeared on the operative side. In cases in which the improvement did not bring the hearing to the practical level, the intensity of the tinnitus was greatly diminished. In cases in which the hearing was further impaired after fenestration, the tinnitus was proportionately intensified. Although the fenestra in the external semicircular canal remained permanently open in 100% of the 120 cases, the hearing was improved in only 70%. Thus, in 50% of the 120 cases in which the newly created fenestra had not closed, the hearing nevertheless remained unimproved.

As a result of the author's technical observations he believes that there is no short technical route to successful surgical intervention for restoration of practical physiological hearing to patients with otosclerosis. It is not amiss to say that the technique advocated is extremely involved and delicate and lends itself to many manual possibilities for failure even in the hands of the most skilled otologist. However, when considering the fact that in order to restore the kind of hearing which can be of practical value to the patient the mere creation of a fenestra no matter how perfect, (1) will be insufficient and cannot result in serviceable hearing unless the fenestra is covered by a certain kind of viable membrane and (2) the entire air-conduction mechanism is reconstructed to serve best and

tomically and physiologically the newly created fenestra, one must realize that no matter what modification can be made in the technique, such a technique will always involve difficulties heretofore not encountered in any other type of operation on the temporal bone

In comparing the merits of fenestration versus hearing aids the following points are established

1 Fenestration restores physiological hearing function, while a hearing aid amplifies the spoken voice without improving the auditory function

2 There is sufficient evidence that fenestration retards and perhaps even checks loss of hearing. A hearing aid permits the loss of hearing to progress so that when the stage is reached in which the hearing aid ceases to be of value, surgical therapy is too late

3 Tinnitus is eliminated by a successful fenestration operation. With a hearing aid the tinnitus remains unchanged

4 Fenestration restores intelligibility of group conversation, while the hearing aid is confusing in group conversation

5 After fenestration the patient can hear conversation or any other sound coming from any direction, even when not directed at him. With the hearing aid he can hear only person to person conversation directed toward the receiver of the hearing aid

6 After fenestration, conversation is heard as it is normally spoken. Conversation with the hearing aid depresses the mental state still further

7 Restoration of physiological hearing as a result of fenestration changes the entire mental state of the patient, whereas the wearing of a hearing aid depresses the mental state still further

8 The hearing aid cannot be employed for direct telephone conversation

9 The social and economic advantages obtained as a result of a successful fenestration operation are limitless. The hearing aid is a deterrent to social and economic rehabilitation

10 The use of hearing aids cannot be compared to the use of visual aids because one is expected to hear conversation or any other sound directed toward oneself or anyone else, in and from any direction, even in sleep

Finally, no surgical risk to life is involved in fenestration of the external semicircular canal when this surgical procedure is performed under the strictest rules of asepsis. As a result of this surgical procedure, practical physiological hearing has been restored in 80 per cent of properly selected cases of otosclerosis. No otologist, no matter how skillful a surgeon, should attempt this operation without special training in this type of procedure under supervision and guidance. NOAH D. FABRICANT, M.D.

NOSE AND SINUSES

Handousa, A. S. Nasal Osteomas. *J. Laryngol. & Otol.*, 1940, 55, 197

Of 840,000 patients seen during the past seven years at Kasr-El-Ainy Hospital, Cairo, Egypt, 37

had benign growths of the nose and sinuses and 18 of these were osteomas

The age incidence was between twelve and fifty-four years, the majority of the patients being under twenty-eight years, and males were affected more often than females. The growths were practically all unilateral and usually single, arising from or attached to the frontal bone in 13 of the total 18 cases. They usually developed in the neighborhood of one of the epiphyses of the frontal bone and in this respect they followed the general rule of osteomas occurring in the long bones

As to causation, syphilis and tuberculosis have been ruled out, but in 13 cases there was an associated inflammation of the sinuses

Symptomatically these osteomas produce few findings except painless swelling, but in many cases there is exophthalmos and occasionally neuralgic pains are present

The differential diagnosis is relatively easy with the aid of the x-rays

The treatment is always surgical but the tumors should not be removed unless they give rise to symptoms. JOHN F. DELPH, M.D.

PHARYNX

Brunner, H. Infections of the Parapharyngeal Space. *Arch. Otolaryngol.*, 1940, 31, 597

The parapharyngeal space or pharyngomaxillary space occurs at the level of the nasopharynx. In order to study the anatomy of this space, three horizontal sections through the skull are used. The first section passes through the middle of the tonsils, the second through the inferior border of the parotid gland at the level of the mandibular angle, and the third through the maxillary sinus. The detailed description does not permit of abstraction

This space is often infected. The source of the infection is usually inflammatory disease of the mucous membrane of the pharynx, particularly of the tonsils

The symptoms are dependent upon (1) the localization and (2) the nature of the inflammation. In general, one can differentiate between two kinds of symptoms: (a) general, and (b) local. The local symptoms can be divided into (1) organic, and (2) mechanical symptoms

The prognosis is dependent upon the constitutional resistance of the patient, the character of the inflammation, and the time at which the operation is performed

Inflammatory diseases of the parapharyngeal space must be treated surgically. In cases of fulminant sepsis and typical phlegmon, only the external approach can be considered. In abscesses which have not progressed far, the endoral approach is justified. This must be performed in such a manner that the superior constrictor muscle is perforated and, as a rule, it is necessary to remove the tonsil. As for the external approach, Waldapfel made it clear that the surgeon must primarily drain the

bases the operation on the blood vessels being of secondary importance. Anesthetics including verfin, are dangerous. Either apparently is best provided the mucous membrane of the upper respiratory tract is not inflamed.

The skin incision can be made along either the anterior border of the sternomastoid muscle or the horizontal branch of the mandible.

The thorax no longer performs prophylactic media thionomy, because the pus seldom granulates the mediastinum the patient succumb much earlier to the sepsis.

Surgery is not of much aid in the cases in which a phlegmon of the parapharyngeal space extends into the base of the skull. JOSEF F. DRYER, M.D.

Barrington Ward, Sir L., Kershaw J. D., Rodgers, T. S., Collier J. and Others: A Discussion on the Indications for Removal of Tonsils and Adenoids in Children. *Proc. Roy. Soc. Med., Lond.* 1910, 33: 347.

BARRINGTON WARD stated that tonsils are more dangerous than adenoids because they harbor infection, adenoids produce obstruction. The importance of adenoids is greatest in the early years of life. The indications for removal are repeated tonsillitis, chronic enlargement of the upper deep cervical lymphatic glands which always indicate a tonsillar infection, and otitis media with its sequences. The indirect indications are rheumatism with its associated corditis, heart disease, borso, and chronic sepsis. The least definite indications are the common cold and postnasal catarrh.

KERSHAW stated that conservative treatment should be tried on the small tonsil with mild symptoms on the moderately enlarged tonsil with slight symptoms, and on the large tonsil with no symptoms. Operation is indicated upon small tonsil with severe symptoms, on moderate tonsil with mild symptoms and on large tonsil with slight symptoms. In case of doubt conservative treatment should be tried, but the possibility of later operation must be kept in mind, because when the environment is such that conservative treatment is not likely to be persevered in there must always be a basis in favor of operation.

RODGERS gave only one indication for tonsillectomy in children, namely repeated attacks of tonsillitis from which the patient does not recover completely in the interval. Recovery of pathogenic bacteria from tonsils is of no importance. There is one indication for the removal of adenoids and that is nasal obstruction unaiding conservative treatment. There are certain common conditions for which tonsils and adenoids are removed needlessly, namely cold, the head, disease of the nose and sinuses, brucellism, and diphtheria. It is estimated that 300,000 tonsillectomies are done in England in 1937 at 85 cents.

COLLIER stated that the view on the physiology of the tonsils do not give much practical help in making decision of treatment. It is known that this

ring of subepithelial lymphatic tissue differs from ordinary lymph gland in having no efferent lymph vessels otherwise it behaves like lymphatic tissue elsewhere. The germ centers, now more accurately called reaction centers, do not develop normally in a sterile environment but spread and harbor bacteria and tend to invade the organism. For this reason it is concluded that protective antibodies are produced in the tonsils.

The chief problem for the laryngologist is to establish relationship between the state of the tonsils and adenoids and the symptom or disease from which the patient is suffering.

WOODMAN said that sufficient attention has not been given to the local condition of the tonsil in relation to operation. Mere size has nothing to do with the question. Great importance should be attached to deep-sepsis and his own method is to use curved probe passed on to the tonsil to ascertain its fixity.

RODGERS said that there is need for critical attitude toward statistics. In the course of fifty years and thousands of tonsillectomies in their hospital they have never had a case of infection following the operation, and because of their follow-up system they would have been certain to know of it if it had occurred. It is important to bear in mind the rate and extent of the operation, such as done. Cases of sinus trouble should always be carefully examined and the trouble removed. Very often it could not be stated whether there is sinus trouble until the patient is actually on the table. Each case must be considered on its merits.

HAYES mentioned series of cases in which acute or chronic attack of brucellism occurred whenever the patients developed tonsillitis. After tonsillectomy there were no such attacks, even the arthritic changes in the joints disappearing to some extent.

BRADLEY said that he believed the tonsillectomy rate in public schools quoted referred to tonsillectomies done before the child entered the school and not afterwards. The Medical Research Council Inquiry into this matter certainly referred in the main to tonsillectomies carried out before entry to school. The impressions of those who worked in operating theaters are likely to be different from those of medical officers who looked after school children.

STARRS said that speaker had suggested that it was the removal of the tonsil itself which caused pulmonary conditions such as chronic bronchitis. He thought that this might rather be ascribed to the inhalation of infected blood-clots at the operation. Unlike his colleagues, he had had case in which lung abscess did follow tonsillectomy but it was in an institution devoted to children with rheumatism and pulmonary disease. JOSEF F. DRYER, M.D.

NECK

Zondek, H. L. Fetal Function of the Thyroid Gland. *Acta med. Scand.* 1930, 3: 5.

In diabetic mothers the metabolic rate may increase during the last month of pregnancy. It has

been observed that in children of diabetic mothers hypoglycemic conditions appeared immediately after birth, which often made it necessary to administer glucose immediately and to continue this treatment for some time. Few data are as yet available concerning the fetal secretion of the thyroid gland. The author has studied this question in connection with a case of hypothyroidism which was under his continuous care.

The patient was a woman thirty-three years of age weighing 67 kgm. She presented evidence of myxedema; her basal metabolic rate was -29 , and her blood cholesterol 423 mgm per cent. Under thyroidin treatment the basal metabolic rate rose to -7 , and the blood cholesterol decreased to 212 mgm per cent. The patient became pregnant and in the fourth month of pregnancy thyroidin treatment was discontinued. In the seventh month of pregnancy the basal metabolic rate was -3 , and in the ninth month, -1 . Five weeks post partum the patient had a severe recurrence of her myxedema with a basal metabolic rate of -29 . Under thyroidin medication the symptoms subsided, but when thyroid medication was discontinued the symptoms recurred.

The author presents this case as the first concrete evidence of fetal thyroid activity.

EARL O. LATIMER, M.D.

Mahaux, J. Basedow's Disease, the Pituitary Gland, and the Central Nervous System (Maladie de Basedow, hypophyse et système nerveux central). *Acta med Scand*, 1940, 104, 42.

Mahaux calls attention to the fact that when Basedow's disease was first described it was considered a disease of the nervous system and attributed to disturbances of the sympathetic nerves and the bulbar region. It was not until 1885 that Gauthier de la Charolle called attention to the rôle played by the thyroid gland. The importance of the thyroid is now recognized, but the cause of the overstimulation of the thyroid is still a matter of discussion. The close relation of the thyroid gland to the pituitary gland and the central nervous system is also recognized. The administration of thyroxin produces nervous symptoms similar to those observed in Basedow's disease.

Recent investigations have indicated that the pituitary gland contains a substance with an "affinity" for thyroxin that results in the fixation of thyroxin, the complex mixture thus formed eventually passes into the di-encephalon and mesencephalon. It appears to act particularly upon the centers in the region of the hypothalamus and on the extrapyramidal motor tracts. Many of the symptoms of Basedow's disease, such as ocular symptoms, motor excitability, and tremor, appear to be due to disturbances of the nerve centers in these regions. The author has seen 2 cases of Basedow's disease with oculomotor symptoms—diplopia in one case and interference with the downward movement of the eyes in the other case—which he

attributes to disturbances in the di-encephalon. The symptoms in these cases were relieved by medical treatment, the medication including prominal, which has an elective sedative action on the di-encephalon.

The increased metabolism of Basedow's disease is attributed to the action of the thyroid secretion on the di-encephalic centers regulating thermogenesis. The maintenance of the heat regulation of the body results in an intensification of thermolysis by the peripheral vasodilatation and perspiration which are characteristic of Basedow's disease.

The "thyrotoxic" crisis that occurs after thyroidectomy is attributed to the sudden modification of the pituitary activity resulting from the loss of thyroxin from the circulation, and resulting in an excess of "thyrostimulin" which acts upon nerve centers sensitized by the previous excess of thyroxin. The logical treatment, on this hypothesis, would be the administration of thyroid extract in the post-operative period.

ALICE M. MEYERS

Brøchner-Mortensen, K., and Møller, E. The Cholesterol Content of the Blood Serum in Thyrotoxicosis. *Acta med Scand*, 1940, 104, 259.

In their study of a series of cases of thyrotoxicosis, the authors determined the basal metabolic rates and the cholesterol content of the blood. During their observations they found that the cholesterol content of the serum of patients with thyrotoxicosis generally lay within the limits of normal persons, although no proof was afforded by the material as a whole of any correlation between the serum cholesterol and the basal metabolic rate. Repeated examinations of about two-thirds of the patients showed that the serum cholesterol rose roughly at the same time that the basal metabolic rate fell and the patient's condition improved. In several of the remaining cases, the changes in the serum cholesterol were found to correspond more closely to the general clinical picture than to the changes in the basal metabolic rate.

The authors conclude, however, that the basal metabolic rate under normal conditions remains the criterion in the clinical examination of patients with thyrotoxicosis, both for the purpose of diagnosis and as a check on the efficacy of treatment.

EARL O. LATIMER, M.D.

Helfet, A. J. A New Conception of Parathyroid Function and Its Clinical Application. *Brit J Surg*, 1940, 27, 651.

The author has based his work on the theory that parathormone controls the blood inorganic phosphate level and prevents the blood phosphorus level from rising enough to upset the metabolic processes. However, an accumulation of phosphate in the blood is a stimulus to an increased production of parathormone. Parathormone effects its control by stimulating the excretion of phosphate by the kidney and by mobilization of the calcium ions from the bones. The calcium renders the phosphate inactive by combining with it. If the parathyroids

are removed the body is unable to deal adequately with the blood phosphate; there is a diminished excretion of phosphate and the calcium ions cannot be mobilized to combine with the phosphate to render it inactive and excretable.

The author goes into detail as to the basis for this theory. It believes the theory explains both the clinical and laboratory findings in hypoparathyroidism as well as in hyperparathyroidism.

Hyperparathyroidism is classified by the author into two types. Primary hyperparathyroidism is due to an adenoma and is typically represented by generalized fibrocystic disease with a raised blood calcium and a lowered blood phosphorus. Secondary hyperparathyroidism may be simple (compensatory or physiological) and pathological. The symptoms of the simple secondary type are mildly those of the primary type but there is no change in the blood calcium and phosphate levels and only hyperplasia causes change in the parathyroid glands. Pathological secondary hyperparathyroidism is caused by the superimposition of an adenoma on the simple type and the symptoms after removal revert to those of the simple type.

The author discusses the symptoms of hyperparathyroidism and the rôle of hyperparathyroidism in generalized fibrocystic disease. He also takes up the possible relationship between hyperparathyroidism and rheumatoid arthritis, as well as the relationship to osteitis deformans. The basis of his

consideration of the relationship to rheumatoid arthritis is the good results he obtained in some of these cases with aluminum therapy.

The treatment of hyperparathyroidism is the reduction of the intake of phosphorus; the stimulus to overproduction of parathormone thus being removed. If parathyroid tumor is present it should be removed. Since the phosphorus intake in the diet cannot be adequately reduced the author used aluminum salts to render the phosphates in the food insoluble. He found that aluminum acetate as the least astringent, but this must be carefully cloaked to be palatable.

Liquid aluminum acetate (R. P.)	40.00
Syrup	4.00
Em. cherry conf. apt	5
Mel depuratum (B. P.)	130.00

The minimum dose of this prescription is 4 c.c.m. four times a day after meals, and at least a pint of milk daily is prescribed. More recently aluminum gluconate has been used. These small doses are continued for months. The results in several cases of rheumatoid arthritis have been most gratifying. Only 1 of 15 patients failed to show any improvement in some manner. As low doses are used the results are slow to be manifested. There have been no cases of ill results from the small doses but the author warns that too large doses can produce rickets.

EARL Q. LATTIN, M.D.

THE EVALUATION OF IRRADIATION IN THE MANAGEMENT OF BRAIN TUMORS

Collective Review

HAROLD C VORIS, M D , Chicago, Illinois

IRRADIATION has been used in the treatment of intracranial tumors almost since the beginning of the present century. Bécclère and Gramegna reported successful results with hypophyseal tumors in 1909, and even before this Hilgartner, in 1903, had reported briefly the use of irradiation in a case of retinal glioma.

A survey of the published literature on this subject reveals a great deal of dissatisfaction on the part of all concerned (roentgenologist, neurosurgeon, and neuropathologist) with our present knowledge of the problem. Conclusions as to the actual benefit of x-rays or radium are still vague and based mostly on apparent clinical improvement following irradiation. Often this improvement has not been differentiated from that due to the preliminary decompression and perhaps partial removal of the tumor. Most of the writers have not found it possible to give the results in terms of a set of survival figures, and even when this has been done, the standards used for the survival figures have varied considerably.

From the standpoint of the literature, it is convenient to discuss the subject under four heads. These are retinal glioma, pituitary adenoma, meningeal and perineural fibroblastoma, and intracranial glioma. It must be emphasized that this is an arbitrary division with no justification except that of discussion of the literature.

The subject of retinal glioma is not properly included in a discussion of brain tumors, but anyone interested in the roentgen or radium therapy of intracranial gliomas can profit by a review of the experiences with these neoplasms. Apparently, Hilgartner's report represents the first attempt to treat a glioma of any sort with roentgen rays. No details of treatment are given except that the fractional method was used. The case was that of a three-and-one-half-year-old girl with a bilateral retinal growth that had caused blindness in both eyes. The tumor in the right eye almost completely replaced the vitreous. After the treatments were completed there was no visible tumor in the left eye and the tumor in the right eye had

shrunk to two-thirds of its former size. No further report was made.

In 1936 Martin and Reese reviewed the subject of the treatment of retinal gliomas. They were able to find reports of 2 five-year and 3 three-year cures in the literature. They added 2 more, one of an eighteen-month cure, the other of a two-year cure. They called attention to the following ophthalmoscopic changes: (1) cloudiness of the retina about the lesion due to edema, (2) alteration in contour of the lesion due to recession of the borders, (3) decrease in vascularity occurring after three or four months, and (4) calcification of the lesion. The end-stage reveals a chalky to pearly white, slightly elevated, avascular mass. These authors stated that the complications of the treatment were (1) hemorrhages, (2) retinal detachment, (3) atrophy of the globe, (4) cataracts which may appear years later, and (5) trophic changes in the skin or cornea.

Fewell and Fry studied histologically a retinal glioma from an eye enucleated because of recurrence. The patient had received 6,800 roentgens during the course of a year, enucleation took place three months after treatment was stopped. Some evidence of degenerative changes in the tumor cells was noted. The cytoplasm was scanty, the margins of the nuclei were not clear, the chromatin was stained irregularly, vacuoles were present, and nucleoli could not be distinguished. Mitotic figures could be seen in some of the areas that showed these degenerative changes.

Smaltino in 1936 also reported another case of five-year cure of a retinal glioma treated with roentgen therapy for over a year. The tumor completely disappeared and vision was restored. The patient was still well with no sign of recurrence five years later.

Because of the accessibility many of these retinal gliomas have been treated by the implantation of radon seeds. Stallard reported such a case with no sign of recurrence of the tumor after two years. He also described the histological appearance of a retinal glioma into which he had introduced a 3.5 millicurie radon seed ten days before removal of the eye. There was necrobiosis,

chromatolysis granulation, and vacuolation of the tumor cells for a radius of 3 or 4 mm. in all directions from the seed. Moore Stallard and Miller described another case with enucleation six weeks after treatment (because of perforation of a corneal ulcer). There was complete destruction of the tumor except for 12 small islands of glioma cells each 0.1 mm. in diameter and situated around the periphery of the tumor. The rest of the tumor showed fibrosis and hyaline change with calcareous deposit. There were hemorrhages, congestion of the blood vessels, and mild leucocytic infiltration.

The reports of successfully treated cases of retinal glioma must be contrasted with the reports of spontaneous regression of these tumors. Martin and Reese found many more of the latter in the literature than they did of cures with irradiation. They believed the cases of cure represented tumors that were unusually sensitive to irradiation. However in both groups of cases histological verification of the diagnosis is lacking. On the other hand, in many of the cases of reported failure treatment was inadequate or the disease far advanced before treatment was begun.

It would appear both from the evidence of the occasional well-established cure (Kasapp's case) and the histological evidence in tumors removed after irradiation that cure is possible in cases of retinal glioma. Treatment must be begun early be prolonged and be adequate. From the literature it would appear that the primary use of irradiation in unilateral glioma (as suggested by Wheeler Key and Ewing in discussion of the paper by Martin and Reese) is justified. In the past, irradiation has usually been used prophylactically on the orbit after enucleation, or on the second eye after enucleation of the first in bilateral cases of retinal glioma.

Apparently the first intracranial tumor to be treated by irradiation was a pituitary adenoma (Béclère and Grunewald) and it is perhaps fitting that of all intracranial tumors the irradiation of this one is on the firmest basis. Béclère considered irradiation as the treatment of choice for pituitary adenoma. Hirsch reported 3 cases treated by operation followed by radium. He obtained good results in all but the cystic tumors. This author did not advise the use of radium without preliminary surgery if the visual fields are involved. Dyke stated that all the pituitary adenomas are radiosensitive, but that the chromophil type is more sensitive than the chromophobe. Naffziger was encouraged by the results of irradiation of pituitary adenomas. He suggested the primary use of irradiation unless vision was rapidly failing,

when operation should be done without delay. Sosman presented evidence that, if visual impairment had been present for over a year the chances of recovery were poor with either surgery or x-ray. He reported the treatment of 14 cases of chromophobe adenoma with irradiation alone. Four cases were hopeless from the start because of extensive invasion or intracranial extension (3 of these terminated fatally in three months). Ten cases were suitable for analysis. In 2 of these therapy was too recent for evaluation at the time of the report. Seven of the remaining 8 patients received marked benefit both as to the restoration of vision and return of the patient to normal living. The duration of improvement had lasted from three to five years with no recurrences at the time of the report. A number of isolated case reports of long periods of remission of symptoms of pituitary adenomas after the use of irradiation have been made (Goodman). It must be kept in mind as Sosman pointed out, that survival period of three, five or even ten years is not sufficient in cases of these tumors to warrant a boast of good results as it could be in cases of malignant tumors. Good results in cases of pituitary adenoma mean restoration of health, and, especially in the chromophobe type restoration or preservation of vision.

It is the opinion of the writer that irradiation is the treatment of choice for chromophil adenomas which produce acromegaly (gigantism in adolescents) for in these cases visual field defects are rare. It should be the primary treatment in cases of chromophobe adenoma in which there are no visual field defects, but these cases must be closely followed and frequently examined for such defects. If visual impairment is rapidly progressive, surgery is the treatment of choice and is to be followed by irradiation as there is evidence to show that the good results following surgery can thus be prolonged and recurrence postponed or prevented. If visual loss has been slowly progressive irradiation may be given a trial as primary therapeutic measure but the visual fields should be carefully examined after a brief period (three or four weeks). If improvement has not taken place surgery should be resorted to without delay. Grant has well emphasized that it is not sufficient for irradiation to hold the loss of vision stationary. In such a case when further visual loss occurs, the surgeon may be confronted with a large spreading tumor—hopeless situation from the standpoint of surgical cure and one bearing a high mortality rate. The immediate good results of surgery are well known—it is not too much to ask that irradiation furnish early

improvement in vision. Another caution must be added, viz., to keep close watch on the patient during irradiation. Sudden further loss of vision due to edema or hemorrhage during irradiation is a rare but recognized complication. Immediate operation should be performed if this occurs.

The subject of the irradiation of meningeal and perineural fibroblastomas can be dismissed with the observation that, aside from occasional unsupported statements in the literature that certain cases of these neoplasms may be benefited by roentgen treatment, there is no evidence that it is of any value. Dyke, for example, states that meningiomas of the fibroblastic type (resembling spindle-celled sarcomas) respond to x-ray treatment. Loew-Beer reported a two-year and three-year cure, respectively, in 2 cases of meningioma. Nuvoli says meningeal tumors sometimes respond very favorably to irradiation. Other writers that mention these tumors at all only do so to state that irradiation is of no value. Angiomas have been routinely treated with x-rays in many clinics—certainly they are very unsuitable for surgical treatment. The writer has no knowledge of any worthwhile results obtained by irradiation.

The effect of irradiation has been studied more thoroughly on the gliomas than on any other group of intracranial tumors. Ewing's prediction in 1921 that those tumors exhibiting marked anaplastic tendencies would be more radiosensitive founded the hope that irradiation of the gliomas would prove uniformly successful. Unfortunately, this did not prove to be the case. Bailey in a report in 1925 mentioned the results in 4 gliomas, 2 of the frontal lobe, 2 of the cerebellar vermis. In 1 of each, irradiation brought about marked clinical benefit, in the other no benefit at all was obtained. The publication of a classification of gliomas the following year (1926) by Bailey and Cushing paved the way for explanation, at least in part, of the differences in clinical response of different gliomas to irradiation. Since that time the significant articles on the subject have all approached the question from the pathological standpoint.

Pancoast pointed out certain characteristics of gliomas which make them suitable for irradiation, viz., (1) they grow slowly and practically never metastasize, (2) often part of the tumor can be removed to give temporary relief and the rest irradiated (this would be considered poor surgery in other parts of the body), (3) exploration of the tumor and biopsy may be followed by irradiation if the location or type of the tumor makes it unsuitable for surgical removal, (4) if the tumor is not found at operation it can still be treated with

irradiation, although admittedly at a disadvantage, (5) if no tumor is found, decompression will give temporary relief from symptoms while irradiation is in progress, (6) a large proportion of gliomas can be regarded as being made up of radiosensitive cells (this is, however, not founded on fact), and (7) normal brain tissue is quite resistant to irradiation.

Practically all authors, except a few overenthusiastic ones, such as Bécélère, emphasize the importance of preliminary exploration with biopsy (if possible) and decompression before irradiation is begun. Albrecht suggested preliminary puncture biopsy followed by surgical removal or irradiation, as the pathological type of tumor indicated. However, most neurological surgeons in this country would frown on such a procedure both because of its inadequacy from the diagnostic standpoint and the dangers of hemorrhage associated with blind puncture of the brain.

The reasons for advocating preliminary operation are well recognized.

- 1 Otherwise one may not be dealing with a tumor at all but with some condition simulating neoplasm. The neurological surgeon is all too familiar with various conditions causing the syndrome of so-called "pseudotumor."

- 2 Clinical localization may be at fault and may be corrected only by surgical exploration.

- 3 Exploration may disclose the lesion to be one that has a good operative prognosis, but is very resistant to the x-rays. If such lesions are given a therapeutic trial of irradiation as advocated by some enthusiastic radiologists, valuable time will be lost and an otherwise operable tumor may become inoperable.

- 4 Partial or subtotal removal of the tumor or decompression will give relief of symptoms until the effect of irradiation can be obtained, and will provide for the relief of the increase in intracranial pressure due to the effect of the x-rays.

The question of the relative value of radium and high-voltage roentgen rays has been much discussed. The greater technical difficulties and dangers associated with the use of radium and the progress made in improvement of the technique of the use of high-voltage roentgen rays has practically resolved the problem in most clinics in favor of the x-rays. Modern technique makes it possible to so closely approximate the gamma ray of radium, even at considerable depth, that there is apparently now little practical advantage with radium to offset the greater difficulties of its application, especially its interstitial application.

The microscopic changes in both tumorous and normal brain have been studied for both radium and the x rays. In this respect at least there is considerable agreement among the writers. Darras and Cutler studied the effect of radium implanted in the brains of cats and dogs and one monkey. They found a zone of thrombosis of small vessels for a radius of 3 mm. about the radium implant. Within a 2 mm. radius there were numerous "glitter" cells loaded with fat and marked demyelination. In this zone, destruction of the nerve cells and the absence of Nissl granules were noted. Later the "glitter" cells disappeared, astrocytes and oligodendroglia took their place, and neuronophagia was noted. Unfortunately, control experiments with the implantation of needles free from radium were not described.

Colwell and Gladstone carried out studies on the effect of radium on the brains of eighteen month-old rats. They described the changes as essentially those of a non-suppurative reactionary inflammation. The immediate effects were a vascular engorgement with escape of erythrocytes from the vessels but not lymphocytes. Twenty-four hours after irradiation there were proliferation of vascular endothelium and perivascular accumulations of small round cells. There was also evidence of localized ataxias. As a late result there was contraction of the arterioles in certain areas with interference of the blood supply and resultant patches of necrosis. Damage to the nerve cells, especially the larger ones, was apparent early after irradiation. There was a change in the staining reactions. Later there were disintegration and total destruction of the nerve cells.

Williamson Brown and Butler studied the effect of radium implanted beneath the skull on the motor cortex of dogs in a dosage of 500 mgm. hrs. Observations made three weeks later showed all of the cells to be destroyed and fragmented within a radius of 5 mm. Surrounding this area was a hemorrhagic zone. The hemorrhages were due to rupture of degenerating walls of blood vessels. Outside of the hemorrhagic zone there was a zone of slight hyperemia.

Alpers and Pascoast referred to the changes in normal brain tissue adjacent to tumors after irradiation with high voltage roentgen rays as consisting of fatty degeneration of the cells of the cortex or of the Purkinje cells of the cerebellum and mild fiber loss in the cerebral cortex. It must be kept in mind that various degenerative changes in both blood vessels and nerve cells are not uncommonly found in the brain adjacent to a tumor.

Lyman and his coworkers gave high voltage roentgen rays (20 human erythema doses) to

dogs. Six weeks later they found degenerative changes in the capillaries and precapillaries. One dog was kept for six months and showed clinical evidence of diffuse cortical and subcortical damage. Microscopic examination showed an obliterating sclerosis of the smaller vessels with consequent areas presenting incomplete and complete necrosis.

Scholz and Hsiel irradiated 2 young patients presenting schizophrenia with deterioration using 4 erythema skin doses through 6 ports in three days. They died a year and a half later without showing any definite focal neurological disturbances. The brains showed severe damage due mostly to circulatory disturbances. There were numerous areas of necrosis and severe fibrosis of the vessels and deposition of peculiar homogeneous substances in the walls of the vessels and the surrounding nerve tissue and the changes in the walls of the vessels resembled hyaline changes. The authors referred to the cases of Fischer and Hoefelder and of Marilewicz, in which late degenerative changes in the brain were observed after intensive irradiation of the scalp. Focal epilepsy developed in both cases, and examination revealed numerous old hemorrhages and areas of necrosis and deposits of homogeneous substances in the walls and around the vessels. These deposits were interpreted as amyloid deposits by Fischer and Hoefelder.

We must conclude that the normal brain can be damaged by irradiation, although with the ordinary therapeutic doses such damage must be minimal. In patients treated intensively and surviving for long periods, the possible late effects must be kept in mind. Some authors, notably Béciré, have stated that irradiation diminishes the formation of cerebrospinal fluid and thus relieves increased intracranial pressure even when the tumor itself is not radiosensitive. However if this were true, irradiation would be a valuable treatment for idiopathic hydrocephalus, when as a matter of fact, it is of no value.

Critical analysis of the effects of radium or high voltage rays on various gliomas reveals little positive proof of definite effect except for one type of tumor—the medulloblastoma. Changes that are said to occur as the result of irradiation include reduction in cellularity of the tumor increase in fibrous tissue, reduction in the number of mitoses, and appearance or increase of giant cells. There is variable amount of thickening of the walls of the vessels with a increased tendency toward areas of necrosis. However it must be taken into account that there is great individual variation in the factors mentioned

even in gliomas of the same group and in different areas of the same tumor. Further, spontaneous changes of the types mentioned are common to all gliomas. On the other hand, many cases that have been studied and reported were inadequately treated by present standards. For example, Lrazier and Alpers collected 114 cases of glioma from several neurosurgical clinics in which pre-irradiation and postirradiation histological specimens were available. Their criterion of adequate treatment was the administration of 2,000 or more roentgen units—obviously their conclusion that treatment was inadequate in most of the cases was eminently justified. These authors quoted Pachard to the effect that the first effect of irradiation on cells is physical with changes in the hydrogen ion concentration of the protoplasm in permeability of the cell membrane and in the viscosity and respiratory rate of the cell. The secondary effect is morphological and includes clumping of the protoplasm and shrinking and agglutination of the chromosomes. These changes are reversible. Further changes are vacuolization of the protoplasm and fragmentation of the mitochondria; these are irreversible.

With the exception of Davis and Weil there is fairly uniform agreement among workers that the medulloblastoma is the most radiosensitive of gliomas. The authors mentioned found it least affected in their study. The writer has personal knowledge of 2 cases of medulloblastoma of the cerebellar vermis that received intensive high-voltage roentgen treatment to the cerebellum and routine treatment of the spinal canal and cerebrum. When signs of recurrence developed additional treatment was given to the cerebellum. Necropsy in both cases showed death to be due to tumor implants in the cerebral hemispheres, in one case in the lateral ventricles; in the other in the cerebral subarachnoid spaces. In both cases there was no local recurrence in the cerebellum. In one there was no gross evidence of tumor in the posterior fossa; in the other only a small nodule was present in the fourth ventricle. The importance of thorough irradiation of the entire cerebrospinal axis cannot be overemphasized in these cases. This is not necessary in other gliomas; this is the only one to spread by implants.

Some intensive reports could indicate change in general type as a result of irradiation. Others have reported then highly resistant to irradiation. The same discrepancy is present in reports of the effects of glioblastoma multiforme.

When we come to the astrocytoma classification, we find a wide range of possible results. In the literature we find the entire range from a

and no good evidence of histological change as a result of irradiation.

As already mentioned, many of the reports emphasize the clinical improvement or the increased survival period following irradiation but fail to take into account differences in location and size of the tumor, in the extent and type of surgery performed, in the difference of histopathological interpretation from clinic to clinic, and in the technique and dosage used in treatment. The writer's knowledge of the latter is entirely second-hand, but it is obvious from the literature that the variations in this factor equal if not exceed those in the others mentioned.

Radium can be used either by means of implantation or the surface pack. The latter would appear to have little advantage over high-voltage roentgen rays except in children or in irrational or uncooperative patients. The use of radium implants would appear to be the most ideal of all methods of irradiation from the standpoint of concentrated effect on the tumor cells. The technical difficulties constitute the chief objection. The difficulty of accurate delimitation of subcortical tumors and accurate implantation of radium element, the necessity for re-opening the wound for removal of the radium, and the dangers of severe injury or hemorrhage in normal brain tissue if the implantation is carried out too near the edge of the tumor are among the difficulties noted. Pancoast warns concerning implantation near the edge of the tumor for the reason stated above. Obviously, however, since the active growth of a glioma is at its periphery, radium implantation will never control a glioma if this precaution is followed.

The present trend in all but a few clinics is to administer high-voltage roentgen rays in fractional doses through multiple portals in much larger total amounts than in the past. Doses of from 150 to 250 roentgen units given daily through as many alternate portals as possible for a total of at least 5,000 roentgen units and repeated in from three to six months in cases which are known to be radiosensitive or show clinical improvement is the method used in the institution of which the writer has personal knowledge.

Great interest attaches to the work being carried on by Sachs and Eisberg independently on the irradiation of tumors through a open craniotomy wound. Here, of course, is a reversal to single massive doses given directly to the exposed brain. As in the reports on the results are too early to present, a comparison of the results with the method here discussed seems premature. It is probable that the results of this method will be of great value in the future.

The dangers of irradiation may be listed as (1) injury to the skin (2) radium osteonecrosis, (3) depletion (4) sloughing or delayed healing of the operative wound (5) injury to normal brain tissue and (6) reactions to treatment. Damage to scalp or bone and sloughing or delayed healing of the wound should not occur in the hands of competent radiologists. However it is wise to allow primary healing of the operative wound before commencing the irradiation. Loss of hair is unavoidable and with adequate treatment will in most cases be permanent. It, of course is negligible in comparison with the gain in successfully treated cases. Injury to normal brain tissue has already been discussed, and must be kept in mind, particularly with the present-day tendency toward increasingly large doses of irradiation. Reactions to treatment are probably usually due to edema or vascular changes in the tumor. Preliminary decompression is of great value in preventing or mitigating them. However at times it may be necessary to administer hypertonic solutions intravenously or to do spinal or ventricular drainages to counteract symptoms of increased intracranial pressure during or following irradiation. Again, the spacing of treatments several days apart may be of value in preventing adverse reactions.

In conclusion, it may be stated that irradiation cannot be substituted for surgery in the treatment of intracranial tumors. In certain tumors, such as retinal glioma, pituitary adenoma, and medulloblastoma, it may not only keep the growth under control but even offer promise of cure. It is of no value in meningioma or perineural fibrosarcoma, astrocytoma, oligodendroglioma or pols spongioblastoma. Glioblastoma multiforme, ependymoma, or angioma may show some favorable clinical response. There is no true evidence that the formation or absorption of cerebrospinal fluid is influenced by irradiation.

In the present stage of our knowledge except in cases of certain tumors with characteristic clinical syndromes such as the pituitary adenoma, exploration with decompression and, if possible biopsy should precede irradiation.

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SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Pérez Zabala, M. Dilatation of the Blood Lakes of the Dura Mater or Venous Aneurysm of the Longitudinal Sinus (W. E. Dandy) Anatomico-surgical Study (Dilatación de los lagos sanguíneos de la duramadre aneurisma venoso del seno longitudinal (W. E. Dandy) estudio anatomocirúrgico) *Rev. Inst. de Cien. Quir. Univ. de Buenos Aires*, 940, 6, 3

Pérez Zabala discusses the venous circulation of the dura and calls attention to the presence of venous lakes in the thickness of this membrane. These lakes are usually developed on each side of the upper longitudinal sinus, especially at its central part and they usually have the form of an irregular impulla and is always enlarged in the anteroposterior direction, is traversed in all directions by numerous connective tissue tracts which run from one wall to the other; in most cases, the cavity contains some Pacchionian granulations. The lakes communicate with the sinus by means of round or elliptical orifices or of real canals which may reach a length of 1 or 2 cm. Usually the meningeal veins empty into the lakes, while the cerebral veins run in the pia and consequently below the lakes and empty directly into the sinus; the upper aspect of the lakes emits diploic and emissary veins. From the point of view of their anatomical significance the blood lakes of the dura are simply diverticula of the venous system into which an excess of blood of the sinuses or of the cerebral veins may be discharged and compression of the nervous centers thereby prevented. A careful review of the anatomical data given by Dandy in the description of his 3 cases of venous aneurysm of the longitudinal sinus shows that these data correspond exactly to those of the venous lakes of the dura.

The aneurysmal masses on the brain and on the cranial bone. It causes symptoms of irritation, paresis or paralysis of the leg and arm, and, in addition, headache after meals or after any effort which increases the intracranial venous pressure accompanied at times by abnormal visual sensations. The bone itself causes a process of destruction and reconstruction which reduces the thickness of the bone and raises the external table above the surrounding part; on palpation the bone may be so thin that it allows the perception of pulsations. Roentgen examination reveals a typical picture of loss of substance of the bone; the three layers may be involved and the external table may be reduced to thin, bulging lamella. This type of loss of substance with softening of the external table is practically pathognomonic of dural aneurysm.

The author reviews the 3 cases reported by Dandy and describes a personal case in a student, aged

eighteen years, who first noted strange sensations in his head after meals or effort and, at times, visual disturbances (faint luminous perceptions) and frontal headaches. During the past six months, the strength of his right arm had decreased; he had never had epileptic attacks. Examination disclosed a swelling, having the consistency of parchment in the center of the median line of the cranium; careful palpation revealed pulsation, and pressure on the swelling caused a disagreeable sensation which could not be called decidedly painful by the patient. Roentgen examination showed the typical picture of bone destruction. A venous aneurysm of the dura was found at operation and, for particular reason, treated with a strychnine gauze tampon which, as left protruding from the anterior angle of the wound. The wound was sutured in two planes. Removal of the tampon was started on the eighth day and finished on the twelfth day; healing was complete on the fifteenth day. Follow-up examination, ten months later, revealed nothing abnormal.

The absence of previous epileptic attacks in this patient was considered as sufficient reason to avoid extensive excision of the dura over the cerebral motor area and replacement with graft of fascia lata, because this technique might have resulted in the production of epileptic attacks or in the aggravation of the paresis. It was thought better to eliminate simply the action of the pulsation on the brain by removing the bony shell and by treating the venous dilatation in the case of sclerosing therapy of varicose veins, the strychnine gauze serving as irritant for the lysis of the aneurysmal sac.

The author concludes that the term dilatation of the blood lakes of the dura mater should replace that of Dandy (venous aneurysm of the longitudinal sinus) and of Peiper (venous aneurysm of the dura mater).

RICHARD KROET, M.D.

Groff, R. A., and Gros, T. F. G. The Surgical Treatment of Brain Abscess by Exposure and Excision. *Ann. Surg.* 940, 9, 5

The surgical treatment of brain abscess is a subject that has caused much discussion and Groff and Gros make convincing plea for the use of surgical exposure and actual excision of such lesions.

They review 7 of their cases treated by this method, 4 patients with single abscesses, and 3 with multiple abscesses. One of the patients with single abscess had the ordinarily avoidable complication of osteomyelitis of the bone flap, but all of the patients had such a smooth convalescence that the authors recommend uncrushing and excision of the lesion as the most satisfactory treatment for brain abscesses which have firm walls. Cerebral herniation, cerebral fungus, great increase in the intracranial pressure, and prolonged dressing all of which may be encountered when drainage methods

are employed, are avoided when the abscess is removed completely within its unruptured wall. Multiple abscesses present a different problem, since they may be in different stages of development, therefore not all of them can be walled-off completely, or they may not all be located. One such patient in this series died of meningitis.

Abscesses resulting from a primary focus of infection, such as a mastoid or a sinus condition, and having a stalk leading from that focus to the abscess cannot be treated by the method of exposure and enucleation at any stage of the infection, since disturbance of this tract is certain to cause meningitis.

JOHN MARTIN, M D

SPINAL CORD AND ITS COVERINGS

Donald, J M., and Morton, B F. The Scalenus-Anticus Syndrome with and without Cervical Rib. *Ann Surg*, 1940, 111 709

The authors describe 21 severe and 19 mild cases of the cervical rib and scalenus anticus syndrome. Of the severe cases 5 were associated with cervical rib or abnormal rib, and 16 were associated with abnormal scalenus anticus. The duration of the symptoms varied from six weeks to eleven years and the symptoms were essentially the same, except for the more prominent objective signs in those cases having cervical ribs. The most consistent symptoms were pain, numbness, tenderness on pressure over the scalenus anticus muscle, slight to marked muscular weakness, and occasional atrophy, with disability due chiefly to the increased pain on motion of the extremity rather than weakness. In addition many of the cases presented inhibited or lost tendon reflexes and diminution of the cutaneous sensibility either over the ulnar or median distribution or over both.

Many of these cases showed vascular changes. These consisted of elevated or lowered blood pressure of the affected side, diminution or absence of the pulse, bruit over the supraclavicular areas, and gangrene. In the majority of instances the radial pulse could be obliterated or greatly diminished by having the patient turn the head toward the involved side and take a deep breath, or by deep pressure over the insertion of the scalenus anticus.

The symptoms are the result of compression of the brachial plexus and subclavian artery by the scalenus anticus muscle. They are precipitated by trauma, occupational strain, and improper posture in patients having inherent anatomical and developmental variations about the shoulders. The syndrome appears to be more frequent than is realized and is a common cause of brachial-plexus neuritis and unexplained vascular disturbances of the upper limbs. The results following tenotomy are excellent with most of the patients being completely relieved of symptoms. Scalenectomy is not indicated in mild cases as these usually respond to conservative therapy. Remissions and exacerbations of the symptoms are characteristic of mild cases. In view

of the essentially identical etiological factors and clinical pictures of the scalenus anticus and cervical-rib syndromes, the authors suggest that the term "scalenus anticus syndrome" be applied to both conditions, and the presence of a cervical rib, if present, specified.

DAVID J IMPASTATO, M D

Rasmussen, T B., Kernohan, J W., and Adson, A W. Pathological Classification, with Surgical Consideration, of Intraspinous Tumors. *Ann Surg*, 1940, 111 513

A review of a large series of intraspinal lesions for which operations were performed at the Mayo Clinic reveals a preponderance of benign tumors which were operable. The earlier intraspinal tumors are recognized, the less will be the damaging effects on the spinal cord and the more complete will be the recovery of the patient when the pressure has been relieved by the removal of the tumor. The factors responsible for the development of tumors of the meninges, nerve roots, blood vessels, and the spinal cord are similar to those responsible for the development of tumors elsewhere.

The first phase of the symptoms of extramedullary tumors is that of involvement of the nerve roots, the second, that of beginning compression of the spinal cord, and the third, that of extreme compression of the spinal cord, which produces the clinical picture of transverse section of the cord.

Intramedullary tumors rarely produce pain, but pass directly into the second symptomatological phase. The sensory and motor disturbances are progressive until a definite transverse level becomes evident. The upper sensory level is less distinct than that produced by extramedullary tumors. Increased reflexes and loss of vesical and rectal control appear early in the syndrome.

The symptoms which play important parts in the diagnosis of intraspinal lesions emphasize the necessity of a comprehensive history in all cases. Following the taking and recording of the history, a detailed general, as well as a neurological, examination is necessary. These examinations should include such special features as spinal puncture, Queckenstedt studies, and roentgenograms of the spinal column, with or without the introduction of iodized oil.

Up to January 1, 1939, there had been performed at the Mayo Clinic operations for 557 verified intraspinal neoplasms. These lesions have been classified pathologically and grouped according to location. There were 163 cases of neurofibroma, 140 of meningioma, 64 of intramedullary tumors, 55 of sarcoma, 47 of extramedullary hemangio-endothelioma, 32 of extramedullary ependymoma, 23 of chordoma, and 33 of miscellaneous extramedullary tumors. The intraspinal lesions were situated as follows: in the cervical portion of the spinal column, 100 cases; in the thoracic portion, 304; in the lumbar portion, 117; in the sacral portion, 35; and at multiple levels, 1 case. It is apparent that the distribution of these tumors with reference to the spinal axis has no predilection for any one region. Neuro

fibroma constitute the largest single group meningiomas, the second largest group, and their primary distribution is in the thoracic region.

In addition to the described verified intraspinal tumors there were 463 additional intraspinal lesions which produced irritation or compression of the nerve roots or the spinal cord, suggesting, clinically the possible existence of an intraspinal tumor or compression of the nerve root and spinal cord by non-neoplastic lesion. Among the 463 lesions there were 64 intramedullary lesions, presumably tumors, cysts of the spinal cord which were not identified by biopsy. There were 29 additional, unclassified lesions situated within the spinal canal. The three removed to date has not been pathologically classified. In this same group of 463 cases, there were 377 non-neoplastic lesions, which included protruded intervertebral disks, osseous compression of the roots and spinal cord, and suppurative lesions (abscesses) within the spinal canal.

The technique of laminectomy has become standardized and, therefore, detailed description is unnecessary.

Hemilaminectomy is definitely indicated in removing lesions of the cervical portion of the cord. When it does become necessary to perform bilateral cervical laminectomy, extreme care should be exercised in closing the incision so that the cut edges of the ligamentum nuchae will be accurately approximated.

Since neurofibromas may arise from the nerve roots within the dura, from the roots as they protrude the dura, or from the peripheral nerve just lateral to the dura, it will be found that these lesions may be situated wholly within the spinal canal, intradurally or partly within the dura, and partly outside of the dura, or they may be situated extradurally with an enlargement and protrusion into the intervertebral foramen, or they may present the typical dumb-bell appearance, with one portion within the spinal canal just described and a similar projection beyond the intervertebral foramen. Neurofibromas situated in the spinal canal, even though they have eroded the bone around the intervertebral foramen, usually can be removed in one-stage operation. Those which are dumb-bell tumors and are situated in the cervical region of the canal are more effectively removed through two separate incisions, and the extradural portion of each tumor is removed first through a lateral cervical incision. Many of these so-called dumb-bell tumors involve the thoracic nerves.

Since both laminectomy and thoracotomy are major operation, it has been our practice to perform laminectomy and remove the intraspinal portion of the tumor first and wait for the patient to convalesce thoroughly from the first operation before performing the second. This period of wait usually extends over a month or so.

Most neurofibromas within the spinal canal have a tendency to degenerate and become cystic, and in a number of instances in the lumbar region, the

neurofibroma have been known to grow to considerable size and erode laminar, pedicles and bodies of the vertebrae without producing signs of complete paraplegia. Neurofibroma involving the root of the spinal cord are usually fusiform but occasionally may be multiple and may be part of von Recklinghausen disease.

Meningioma fibrosarcomas originating from the arachnoid may be situated in any portion of the spinal canal and any part of the circumference of the canal about the cord, and produce pressure at the point of origin. The most common site of origin of such a lesion is about the nerve root, but not originating from it. The meningeal attachment is usually rather limited although the tumor may grow in all directions without becoming attached to the cord.

Following the removal of meningiomas and neurofibromas, the surgeon frequently observes marked indentations of the cord. Complete recovery of the patient will take place if the blood supply of the cord has not been destroyed.

The surgical consideration of intramedullary tumors applies almost entirely to the entire group of lesions, even though they may vary in their pathological classification. Most of them are glomatous origin. The largest group is ependymoma. These tumors originate from the ependymal cells lining the central canal. Unless cystic degeneration has taken place in or about the tumor, the surgical approach is the same for all intramedullary tumors. It is impossible completely to remove glomatous lesions of the cord since there is no line of demarcation permitting excision.

Ependymomas originating within the filum are not encapsulated, but they are surrounded by pia mater. They produce marked erosion of the bone without invading it, grow in between the nerve roots of the cauda equina, increase the size of the lumbosacral canal, may enlarge the intervertebral foramen, and grow to the soft tissues of the back—but they apparently do not metastasize. The surgical problem is to perform extensive laminectomy in order thoroughly to uncover the tumor and then to proceed with careful dissection and removal of the tumor without impairment of the blood supply or damage of the nerve roots. Complete removal will result in cure; failure to accomplish this will result in recurrence.

Following the operation, the patient is placed in bed in the lateral position on pillows, to avoid undue pressure on the tips of the shoulders and on the hips. It is preferable to turn the patient from side to side and on the abdomen rather than to allow him to lie on his back, because sweating may result in maceration of the skin and contamination of the incision, and may interfere with primary union. The patient otherwise is treated as is the average surgical patient.

The frequent occurrence of primary intraspinal tumors, which are usually benign and operable, justifies thorough examination of all patients who complain of root pain or of progressive motor or

sensory disturbance of the extremities. The diagnostic methods at our disposal will invariably affect the differential diagnosis. Surgical treatment, if it is to be instituted, should be employed before the patient becomes paralyzed.

PERIPHERAL NERVES

Lapinski, Z. Spinal Cord as a Dead Transplant in Defects of the Peripheral Nerves (Rueckenmark als totes Transplant bei Defekten von peripheren Nerven) *Polski przegl. Chir.*, 1939, 18: 445

The author undertook the continuation of experimental studies of Gosset and Bertrand on heteroplastic spinal cord transplantation for loss of substance of the peripheral nerves. In 5 dogs transplantations were made with portions of spinal cord from 1 to 3 cm in length, which were prepared according to the method of Gosset, on 1 control animal the cutting of a nerve was immediately repaired by an end to end suture. The extremity regained its function after from five to six weeks but was never restored completely, the leg remained a trifle weaker and the animal was not as certain in its use. After from fifty to eighty days the implant was examined microscopically and the author concludes:

- 1 Spinal cord is a good heteroplastic transplantation material because it contains very little connective tissue and because it has a rope like structure.
- 2 Only the white substance of the spinal cord has practical significance in the regeneration of nerves.
- 3 The regeneration of the nerve is not slower than that with simple nerve suture.
- 4 The number of nerve fibers after transplantation is the same in the peripheral end as after simple nerve suture.
- 5 The transplant does not delay wound healing.

(L. TONENBERG) LEO A. JUHNKE, M.D.

Koestler, J. Results of Animal Experiments with Operations Utilizing Prepared Substitutes for Defects from Nerve Injuries (Ergebnisse des Tierversuches bei vorbereitenden Eingriffen zur Ersatzoperation bei Nervenschaden) *64. Tag d. deutsch. Ges. f. Chir.*, Berlin, 1940.

According to Gebhardt one of the main reasons for failure of operative procedures on injuries of the peripheral nerves is the trophic, tonic, and vasomotor disturbance in the involved limb portion. To influence this disturbance it seemed that the continuation of experiments begun by Felix on the diaphragm of the dog were in order.

The tibial nerve was chosen for the experiments. After the severance of this nerve its distal stump was inserted into the sympathetic-parasympathetic plexus surrounding the large vessels, in the so called vegetative or autonomic system, to see if it was possible to restore the muscle nerve unity by way of the sympathetic-parasympathetic tract. In the control animals the same severance of the tibial nerve was done without implantation of the distal stump into the sympathetic-parasympathetic tract.

The results of the procedures were decidedly different. In the animal in which no implantation of the distal stump was done there appeared changes in growth of the hair, of the claws, and of the cushions of the feet, resulting in the formation of ulcers, eruptions on the skin—all trophic disturbances. All these changes were not seen in the dogs in which the distal stump was implanted into the sympathetic-parasympathetic ganglia or tracts. Whereas the dog without implantation of the stump had a strong limping gait as a result of lowered muscular tone, the dogs in which implantation had been done showed this limping in much lesser degree or it was hardly noticeable.

In addition to this difference in muscle tone there was also a noticeable difference in the microscopic picture of the weakened muscle tissue. In the non-implanted muscles there were typical changes of muscle atrophy and muscle degeneration to a marked degree, whereas in the implanted muscles these changes were hardly noticeable or entirely absent. In the cases in which implantation was done at the site of entrance of the nerve into the muscle there were a few atrophic fibers beside many perfectly normal fibers. To what extent this relationship pertains to the nerve endings will be investigated further.

The vasomotor regulation was not investigated in these experiments as dog paws are not suitable for such a determination. With a close physiological relationship between trophic and tonic regulation it is plausible to assume that a vasomotor influence is likewise present.

By this operative procedure it seems possible to influence the trophic, tonic, and vasomotor regulation of a limb in which a nerve injury has occurred, but an improvement in the motor function has not been observed. (ROESTLER) LEO A. JUHNKE, M.D.

SYMPATHETIC NERVES

Foerster, O. Operative and Experimental Experiences in Man on the Influence of the Nervous System on the Circulation (Operativ-experimentelle Erfahrungen beim Menschen ueber den Einfluss des Nervensystems auf den Kreislauf) *Ztschr. f. Neur.*, 1939, 167: 439.

It is an established anatomical fact that the blood vessels are everywhere surrounded by a thick network of nerve fibers. Physiological data demonstrate the fact that the nervous system exerts a characteristic influence on the circulation. The question is, how far reaching is this influence? One cannot definitely answer the question of whether or not the necessary blood supply of a functioning organ is absolutely dependent on the neural integrity of its blood vessels. It is certain only that a limb, severed from its connection with the central nervous system, no longer reacts to those stimuli which influence the circulation reflexly, that is, stimuli effective in parts other than the paralyzed limb, yet local blood vessel reactions are produced.

in each limb by thermal, mechanical, or electrical stimuli. Thus there are autotachonous blood-vessel reactions which in general resemble the usual effect but which have their own unmistakable characteristics. How can this be explained? The following statement has not absolutely been proved true but it seems highly probable: the overwhelming majority of the vasoconstrictor and vasodilator nerve fibers in the blood vessels pass successively from the peripheral nerves to the blood vessels primarily within the extremities. Nevertheless, a complete vasomotor interruption in all the peripheral nerve trunks of the extremities is in no way accomplished since there is a still important nerve plexus which passes directly (and not by the roundabout way of the gray rami) communicates with the peripheral nerves from the sympathetic chain to the subclavian and iliac arteries. Besides the peripheral arteries have their intrinsic nerve plexuses and ganglion cells.

In connection with all these questions it is interesting to note Foerster's opinion that when an operatively isolated nerve is electrically stimulated it always produces only vasodilatation. And yet there is not the slightest doubt that the peripheral nerves contain numbers of sympathetic vasoconstrictor nerve fibers. Possibly our means of experimental stimulation are too crude to appreciate their action. In regard to the autotachonous local vessel reaction there is yet one fact to be kept in mind: a muscle that is completely de-innervated striated muscle still reacts fairly well to direct stimulus with certain chemical stimuli, namely the sympathicomimetics choline and pilocarpine especially if they are injected directly into the blood stream. In this regard one may cite an interesting experiment of Foerster. In a patient with traumatically severed median and ulnar nerves, he freed the nerves operatively and injected a c.c.m. of choline directly into the brachial artery. Immediately all five fingers contracted energetically to make a fist, while previously they could not move and so firm as their contraction that they could not be straightened out by force. The clenched fist was relaxed only after the patient was given a gram of adrenalin. The smooth musculature of the blood vessels seems, therefore, to be influenced. With regard to activation of its function more strongly than the striated muscles upon chemical stimulation. If pilocarpine is injected subcutaneously into some part of the body in the presence of a completely severed peripheral nerve, vasodilatation in the area of supply of the severed nerve will be found immediately. The local blood vascular system exhibits an unmistakable sensitivity to all hormonal influences after the division of vasomotor nerve.

The sympathetic system is the main source of the vasoconstrictor fibers. Removal of the stellate ganglion frees the blood vessels of the arm of their sympathetic supply. Section of the lumbar chain frees the leg. The results of these operations in anastomotic conditions are undisputed but there

arises the question as to why the results in the legs are almost always very good and long lasting, while those in the arms are often a failure. The reason is that every sympathetic influence to the arm is interrupted by stellate gangliectomy while this is not true in the legs following section of the lumbar trunk. In the case of the lumbar operation usually the second and third, at most the fourth ganglia and chain are removed while the first and fifth lumbar and first, second, and third sacral ganglia are preserved. In this case, also, the matter of preganglionic removal and the fact lies the fundamental difference. With gangliectomy and postganglionic sympathectomy there arises a new hypersensitivity to adrenalin in the blood vessels and an increased vasoconstrictor reaction to local cold stimuli all of which is entirely missing in preganglionic sympathectomy and in supranuclear diencephalic spinal sympathetic paralysis (White animal experiments of Ascroft and others, Foerster's own cases of human subjects). In the latter type of case it makes no difference whether the dorsal cortex hormone is given subcutaneously or otherwise or whether it flows as the result of fit of anger. For three years Foerster has made observations on differential diagnostic symptom between the two types of sympathetic paralysis, that is on adrenalin hypersensitivity of the miotic pupil in Horner's syndrome. On the grounds of these observations White recommended that the stellate ganglion not be removed, but that preganglionic sympathectomy be done. Foerster had a puzzling result: a patient with Raynaud's disease in both the fingers had already reached a state of suppurative gangrene and, before operation, healed in very short time with no loss of tissue. The method is very simple: resection of the second rib and transverse process of the second thoracic vertebra. However the plexus lies close by and must not be injured. The sympathetic nerve does not lie exactly in the paravertebral groove, as the text books state.

Foerster believes that our knowledge of the preganglionic vasoconstrictor fibers to the arms and legs is far from adequate but that we have sufficient knowledge of the postganglionic sympathetic supply to those parts. Those for the arm come from the middle and inferior cervical ganglion and the first and second thoracic ganglion (that is, cord segments C through Th). The postganglionic fibers to the legs rise from the fifth lumbar and the first, second and third sacral ganglion. It is known that the sympathetic chain ganglia receive their impulses from the lateral gray horns of the spinal cord. From these cord nuclei arise the preganglionic fibers which then pass through the anterior roots and thence through the white rami communicate into the corresponding ganglia of the chain. However this lateral gray horn of the sympathetic begins in the lower portion of the eighth cervical segment and ends in the upper portion of the third lumbar segment. Thus, the sympathetic supply for the entire body is crowded together into a relatively

small space This short spinal representation is entirely segmentally arranged for its somatic supply, as can be established by stimulation experiments. However, we do not know whether the seventh thoracic segment takes part in the vasoconstriction innervation of the arm. It is certain that section of the chain between the second and third thoracic ganglia immediately does away with vasoconstriction in the arm, without destroying a single preganglionic fiber. So far as the legs are concerned it is not entirely established whether the origin of the preganglionic vasoconstrictor fibers in the cord includes the ninth or eighth thoracic segments. It is known that section of the chain between the second and third lumbar ganglia throws out of function the great majority of the preganglionic fibers.

Eventually, Foerster applied himself to the matter of the splanchnic nerves and essential hypertension. The latest researches on these subjects are not entirely clear, they have some bearing on the matter of the origin of the splanchnics which contain predominately preganglionic fibers, but we do not know whether the spinal origin is to be found in the corresponding segmental lateral gray horns of the spinal cord. Max Peet and Kahn have had excellent results from bilateral splanchnicectomy in animals. Adson's operation with the interruption of the preganglionic fibers by resection of the lower thoracic anterior roots and upper lumbar anterior roots cannot produce the same results as Peet's, since in Adson's operation a motor paralysis of the lower abdominal musculature and a portion of the proximal thigh muscles is combined. Since the splanchnics are not only the vasoconstrictors to the abdominal viscera, but are also the controlling mechanism in the secretive action of the suprarenal glands, their removal should produce a simultaneous decrease of adrenal secretion. Foerster has not removed the thyroid in the treatment of hypertension, as Cutler has done. It seems to Foerster as very remarkable that no one has recommended hypophysectomy as treatment for high blood pressure, since so many authors represent the basophilic centers of the pituitary gland as the main source of a "high pressure hormone." At any rate the surgical treatment of hypertension is still in an infantile state.

Returning to the subject of vasomotor innervation, he emphasizes the fact that the preganglionic vasoconstrictors, which arise in the thoracic and upper lumbar cord, make their way through the anterior roots, while the vasodilator fibers have the entire spinal cord for their seat of origin and pass out through the posterior roots. If one sections a posterior root and then electrically stimulates the distal segment, a sharply circumscribed hyperemia of the corresponding skin, that is, of the corresponding dermatome, occurs quickly. One may ascribe these effects to an antidromic conduction of the sensory posterior root fibers. Foerster agrees with Gagel that efferent posterior root fibers occur in man, a subject that is widely disputed. Since nerve fibers are still

present in the central segment of a sectioned posterior root from three to four years after section, their origin could be only in the spinal cord. They are not new growths, since care was taken to resect several centimeters so that a wide gap resulted between the dorsal root ganglion and the cord. The third objection, that these fibers arise from another spinal center, the fibers of which for some time rose or descended in the posterior columns and then grew into a new root location, he holds to be absurd, since in his own cases he carefully sectioned from 4 to 6 neighboring roots, completely and entirely and the afore-mentioned "wandering" of the root fibers through the spinal cord to find another root is not substantiated by his results. The cat experiments of Duncan and Krockner, in which they find an aberrant spinal ganglion in the central end of the sectioned posterior lumbar roots, must still be confirmed.

However, there are also supranuclear central vasomotor pathways which have priority over the spinal pathways. If one completely sections the spinal cord in the lower cervical or upper thoracic regions there is an immediate vasodilatation of all the body below the segmental level of the lesion. Hyperemia of the genitalia (semi-priapism) is noted especially. This procedure cuts off the supranuclear pathways of vasoconstriction which lie in the mid-brain. In approximately 100 cases of section of the anterolateral spinal pathways Foerster effected a drop in pressure in many cases, and in some of these cases with hypertension the postoperative drop was even greater. It has been shown that this drop occurs only when the chordotomy interrupts the dorsal-most bundles of the anterolateral columns. On this basis the opinion seems supported that the supranuclear vasoconstrictor pathways in the spinal cord lie in these posterior-most parts of the anterolateral pathways, exactly in front of the pyramidal tracts. The anterolateral pathway sections were all in the region of the first or second thoracic segments. Foerster is undecided as to the effect of a deeper chordotomy, as practiced by some, in separating the lateral gray matter from the motor influence of the brain. He does not select bilateral chordotomy as the operation of choice in the treatment of hypertension, since he reserves this operation for the treatment of intractable pain. He has made regular observations on the vasoconstrictor reflex in the patients with chordotomy. This is located in the brain stem and is entirely linked up with the undamaged condition of the supranuclear diencephalic-spinal vasoconstrictor pathways. However, most extraordinary was the finding that even in the total division of the cord in the lower cervical region the vasoconstrictor reflex from arm to arm was lacking, but the cold reflex between them was not lacking. The descending supranuclear vasoconstrictor pathways for the arms lie concealed in the tissue which bounds the posterolateral border of the anterior horn and the pyramidal tract. If these fibers are cut in a chordotomy the reflexes com-

pletely disappear and in that instance the drop in blood pressure is most pronounced of all. In contrast to the vasoconstrictor reflex, the vasodilator reflex is located deep within the substance of the cord (Mueller). Foerster does not discuss the complex problems of the influence upon the circulation by the brain, especially the brain stem, the visceral vagal nuclei, and the hypothalamus, nor the cortical representation of the blood vessels and the cerebral cortical influence upon them. The far reaching dependence of the circulation upon the brain is an established fact. (F 12) JOHN MARTIN M.D.

Smithwick, R. H.: The Rationale and Technique of Sympathectomy for the Relief of Vascular Spasm of the Extremities. *New England J. Med.* 940, 699

The author has had very wide experience in sympathetic surgery and is responsible for many of the perfections of this work. In this article he describes the most adequate way of producing a com-

plete sympathectomy in the extremities. The rationale for these procedures is explained briefly.

The procedure suggested for the upper extremity is intrathecal division of the second and third intercostal anterior and posterior roots and division of the sympathetic trunk below the third ganglion. The lower end of the sympathetic chain is tied off and the upper end is sewn into the wound. The procedure is carried out extrapleurally with removal of part of the third rib and the third transverse process.

The sympathetic nerve supply to the lower extremity is approached extraperitoneally through an incision in the loin. Between the second and third lumbar ganglia and the intervening chain are removed in between the first, second, and third lumbar ganglia are removed.

Both these operations are attacks on the preganglionic fibers, which are necessary if recurrence of vasospasm is to be avoided.

ADRIAN V. BARNES, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Hicken, N F Intracystic Papilloma of the Breast
Surgery, 1940, 7 724

Papillomas may arise from any segment of the galactophorous ducts, but they are generally found in the larger lacteal sinuses adjacent to the nipple. Hyperplasia of the epithelial lining and the fibrous tissue components of the milk ducts are both present. The epithelial cells proliferate so much faster than the connective tissue that the tumors are compelled to invaginate into the lacteal lumen. The wall of the cyst which contains the papilloma is merely that of the dilated parent duct. This duct usually contains a serous, serohemorrhagic, mucoid, purulent, or pultaceous secretion, which consists of degenerating epithelial cells, corpuscles of Gluge, leucocytes, granular debris, cholesterol scales, blood corpuscles, fat globules, bacteria, and amorphous substances. If the duct is completely obstructed by the tumor there will be a complete retention of the secretions, giving rise to the so called intracystic papilloma.

Thickening and induration of the duct wall may be produced by deposition of fibrous tissues incident to the inflammatory or chemical irritation.

In the author's experience, papillomatous lesions are potentially malignant. Any breast which gives rise to these proliferative epithelial neoplasms is making an abnormal growth response and only time can tell what the final outcome will be.

In one instance serous cysts, mazoplastic changes, a fibro adenoma, a papilloma, intraductal epithelial hyperplasia, and a papillary adenocarcinoma were all found within the same breast.

In a series of 18 cases this author encountered 2 which exhibited both benign and malignant intracystic papillomas in the same breast.

Intracystic papillomas are a disease of early middle life. They occur in both sexes, but are much more common in women. In the literature there are revealed only 3 instances in which papillomas were present during pregnancy or lactation. They seem to appear during the resting phase rather than while the breast is actively functioning. These neoplasms usually grow slowly. In some cases they have been observed for more than thirty years without any appreciable change. In this author's series, the average time elapsing before medical advice was obtained was four and one half months.

Hemorrhagic or serosanguineous discharge is the most frequent symptom of intracystic papilloma. This discharge may occur weekly or monthly, or even at yearly intervals, or it may be continuous.

Not every bleeding papilloma produces a discharge from the nipple, therefore it is extremely important to study the nipple and all escaping secretions. In one of the author's cases cancer cells were

detected in the escaping discharge. A bloody discharge does not necessarily mean a duct papilloma, for it can occur with any condition which produces erosion of the ductal epithelium. A girl, nineteen years old, in the eighth month of pregnancy had a bloody discharge from both breasts. No infection was found, no abnormalities in size, shape, or conformation of the milk ducts could be demonstrated. As soon as lactation began, the bleeding stopped spontaneously. An excessive vascularity incident to the functional hyperplasia of the lactiferous ducts was responsible.

Pain is seldom present with a papilloma. Detection by palpation may be most difficult. The tumor is often small in size, and composed of soft, compressible tissues. Ninety-five per cent of the papillomas are situated within or directly beneath the nipple in the subareolar zone. Manipulation of the tumor exerts traction on the parent duct and hence retracts the nipple in the same direction as the applied force. If located within the nipple or immediately beneath it, the expanding growth may push the nipple outward. Transillumination studies are frequently valuable in the larger papillomas.

Diagnosis can be made by accurate roentgenographic patterns of these intraductal tumors by the introduction of contrast substances into the diseased lacteals.

In the author's earlier studies various radiopaque substances, such as lipiodine, hippuran diodrast, and thorotrast were used. Thorotrast was found to produce granulomatous lesions, and therefore it was discontinued.

It has been found that skiodan viscous is a suitable substance. It is an aqueous solution of iodides, but a rapid diffusion is prevented by holding the soluble iodides in a suspension of viscous gum acacia. Skiodan viscous remains within the lactiferous tubules from three to ten minutes, a sufficient time to permit accurate roentgenograms to be taken before it is absorbed. Thirty minutes after the ductal injections are made no skiodan viscous can be found within the ducts.

Fifty diagnostic mammograms using skiodan viscous have been made in virgin, lactating, resting, and diseased breasts without any untoward complications.

Five actively functioning breasts have been injected without diminishing the flow of milk or interfering with the regular periods of nursing.

J DANIEL WILLEMS M D

Trout, H H The Role of Irradiation in the Treatment of Carcinoma of the Breast *Ann Surg*, 1940, 111 700

The author prefaces his paper with the statement that he does not believe there is at present any substitute for the radical operation in the treatment of

carcinoma of the breast. While much harm can be done by an improperly executed operation, even more harm can come from improper irradiation.

The law expressed by the author are based on his study of the literature, discussions with medical colleagues, and an intimate and close study of 600 cases of carcinoma of the breast observed for over quarter of century. He believes that any form or frequency of irradiation that produces necrosis of the skin is harmful. A trial dose of irradiation should be employed whenever possible to obtain some idea of the patient's skin response to irradiation.

It is the author's opinion that breast cancers in younger women are more radio-sensitive than those found in older women. This is because more carcinomas of Grades 3 and 4 are found in this age group. The addition of irradiation has improved the prognosis in this younger age group more than it has in the older age group. Better results are obtained in the younger group from irradiation at shorter intervals than seems desirable or necessary for older women. Also more inoperable carcinomas of the breast has been found in young women than in women past the menopause.

The general plan as employed by the author is to irradiate pre-operatively, to place many small tubes of radium around the entire operative field and under the skin at the time of operation, and to follow this with postoperative irradiation. It is not always possible to employ all three types of irradiation.

Pre-operative irradiation is indicated especially in the following cases: (1) for patients having palpable nodes in the axilla, (2) when the malignancy is fixed to the skin or underlying muscle, (3) when it is hoped to operate under local anesthesia because of the physical condition of the patient, (4) in rapidly growing malignancy especially if associated with infection, (5) in malignancy of the breast associated with pregnancy, (6) in some inoperable case that may be made operable, and (7) for the implantation of a carcinoma in the tract of an aspiration biopsy needle.

The amount of skin excised is becoming larger so that it is more frequently necessary to use skin grafts. Postoperative irradiation is begun ten days following operation. This method also applies to those cases having skin grafts.

From 90 to 920 there are 5 cases in which only the radical operation performed. In this group there were local recurrences and the 3 or more years cures amounted to 10 per cent. From 920 to 944 there are 80 cases in which radium implantation under the skin as used in the radical operation. In this group there were 4 local recurrences, and three or more years cures occurred in 50 per cent. From 944 to 939 there are cases in which radium as inserted at the time of radical mastectomy and postoperative irradiation done with 9 local recurrences and three or more years cures in 55 per cent. Also from 944 to 939 there are 26 cases treated by pre-operative and post-operative irradiation and radium as inserted at the time of operation. In this group there are no local

recurrences and three or more years cures occurred in 55 per cent.

The author has also used irradiation of the ovaries in patient with carcinoma of the breast. He believes it is indicated in patient in whom the tumor is rapidly growing if there is an associated infection, if pregnancy is present, when the tumor is fixed to the skin or underlying muscle, in cases of recurrence, and in patient with inoperable carcinoma of the breast.

EARL O. L. TORRIS, M.D.

TRACHEA, LUNGS, AND PLEURA

Hudson, A. M. Thoracoplasty I. Pulmonary Tuberculosis. A General Survey of 47 Cases. *Australia & New Zealand J Surg* 940, 9-350.

Hudson reviews the evolution of the operation of thoracoplasty for the treatment of pulmonary tuberculosis. He clearly outlines the indications and contraindications for the operation and presents the results in 47 patients who were operated upon in the Austin Hospital. A total of 5 operations were done. Seven patients died, mortality rate of 6 per cent per operation and 5 per cent per patient. Six patients died of the tuberculosis at varying periods up to 1 year after the operation.

Thirty-four patients are still living. Twenty-four or 70 per cent have negative sputum and are apparently cured. Of the 11 who are working. Ten other patients show definite improvement in their conditions, but have positive sputum.

JULIUS L. MOORE, M.D.

Hudson, W. A. A Selective Type of Thoracoplastic Operation. *J Thoracic Surg* 940, 9-357.

Hudson describes a modification in the technique of thoracoplasty combined with an apicectomy in the treatment of pulmonary tuberculosis.

The usual technique is to remove three ribs as far forward as the costal cartilages through a posterior incision. If an apicectomy is added to this procedure the entire apex of the pleura is stripped from its fascial attachments and the apex of the lung is pushed down.

Hudson removes the whole of the first and second costal cartilages and ribs through an anterior incision and separates the pleura from all fascial attachments except at its extreme apex. This prevents the apex of the lung from dropping into the dissection of the chest. At the second stage, shorter than usual posterior incision is made through which the third and fourth ribs are removed in long lengths. Any remaining tip of the second rib and the transverse processes of the second, third, and fourth vertebrae are removed. At this stage the pleura is further stripped from its fascial attachments. Subsequent removal of more ribs through posterior incision is done if necessary. Pressure pads are applied in front and in the axilla, and these are worn for at least three months.

In Hudson's experience, this technique has been very satisfactory. JULIUS L. MOORE, M.D.

O'Brien, E J, Day, J C, Chapman, P T, and Tuttle, W M. A Study of the Immediate and Late Results in 511 Patients Subjected to Thoracoplasty. *J Thoracic Surg*, 1940, 9 364

O'Brien and his coworkers report their experience in the cases of 511 patients who were subjected to 1,404 thoracoplastic operations

The immediate mortality rate (patients dying within eight weeks) was 9.39 per cent, the late mortality rate 9.78 per cent

Cavity closure was effected in 87.02 per cent of the patients, and sputum conversion in 81.65 per cent

One hundred and eighty-seven patients are apparently cured, the condition has been arrested in 82, and apparently arrested in 40, it is quiescent in 26, and unstable in 49. Twenty-six patients could not be traced

Of 296 patients at home, 224 are working and able to work

In addition to the above statistics, O'Brien calls attention to many practical experiences which have led to improvement in the selection and management of the patients. A most important practice is the routine bronchoscopic examination of all patients before they are subjected to thoracoplasty. Nearly 10 per cent were found to have tuberculous tracheobronchitis. This knowledge is essential before subjecting patients to thoracoplasty

In their experience, bronchoscopic aspiration of retained secretions after operation contributed to lowering the mortality rate and has saved the lives of quite a few patients

The authors are very liberal in accepting patients for thoracoplasty. Many patients receiving pneumothorax on the contralateral side were accepted for thoracoplasty. The authors believe that the mortality rate could be lowered and the end-results improved if they accepted only good risks. However, they think it the surgeon's duty to rescue as many patients as possible, and do not hesitate to operate on many bad risk patients as long as there is a reasonable chance of arresting the disease

JULIAN A. MOORE, M.D.

Fruchaud, H., and Bernou, A. Late Results of Thoracoplasty in Pulmonary Tuberculosis (Résultats éloignés de thoracoplasties dans la tuberculose pulmonaire). *Mém. l'Acad. de chir.*, Paris, 1940, 66 245

Fruchaud and Bernou report their results in 242 cases of pulmonary tuberculosis in which thoracoplasty was done by their special technique, the essential feature of which is that the first rib is not resected until the second stage of the operation. At the first stage of the operation the fifth or sixth to the second ribs are resected. The resections in this stage are not extensive, if the sixth rib is resected, not more than 4 cm are removed, a larger portion of the upper ribs is removed, but the resection is almost complete only for the second rib, of which only from 2 to 3 cm are left. In the second-stage

operation, another of the lower ribs may be resected, i.e., the sixth if this was not resected at the first stage, but this is not always done. The resections of the other ribs are enlarged, and the second rib is completely removed to the cartilage. The first rib is then removed completely, often with a part of its cartilage. If a third-stage operation proves necessary, the seventh rib, or perhaps the seventh and eighth ribs, are partially resected, rarely the ninth rib, the resection of the upper ribs is enlarged, with complete removal of the third rib to the cartilage.

These operations are well supported by patients, even those in poor general condition, and those who are febrile with active progressive lesions. There is almost never any surgical shock, and rarely a death in the first three weeks following operation. With this technique the collapse of the lung occurs more gradually but is more complete than with the usual method of thoracoplasty. Strict asepsis must be maintained in the operative field after the first-stage operation.

Among the 242 cases operated upon by this method (532 operations), there were 174 cures, 35 cases with partial improvement, and 33 deaths. Only 9 of the deaths occurred in the first three weeks after operation, the others at a later period. These 33 deaths included those cases in which a second-stage operation could not be done. Thus with this type of thoracoplasty cures were obtained in 71.31 per cent and there was some improvement in an additional 14.34 per cent of the cases. The results were best in those cases in which the indications for thoracoplasty were definite and the cases were of the type considered most favorable for operation, in this group there were 148 cases, with cures in 127 (85.81 per cent). An additional 19 patients (13.51 per cent) showed improvement in their conditions. There were only 2 deaths in this group, one of these occurred postoperatively in a patient who showed toxemia from treatment with gold salts. In 35 cases the indications for thoracoplasty were less definite (very large cavities or non-progressive bilateral lesions), many surgeons hesitate to operate in such cases. In this group, there were 27 cures, (77.14 per cent), 6 cases with partial improvement, and 2 deaths. In 59 cases the indications for operation were doubtful in most of these the lesions were progressive and some surgeons would have considered them inoperable. The percentage of deaths was high in this group, 49.16 per cent (29 deaths), but most of these deaths did not occur until late, from the natural progress of the disease. However, 20 of the patients in this group (33.89 per cent) were cured, and another 16.94 per cent (10 patients) showed improvement in their condition.

These results, the authors find, are superior to those reported with the usual type of thoracoplasty and compare favorably with those reported for the Semb operation (thoracoplasty with apicolysis). The operation described, they claim, is safer and less likely to cause shock than the operation with apicolysis in the first stage. If apicolysis proves to

be necessary as indicated by the results of the first-stage operation. It can be done at the second stage of their operation. *Ann. M. M. 1918.*

Collis, J. L., and Foster-Carter, A. F.: Spontaneous Pneumothorax and Staphylococcal Lung Abscess in an Infant. *Lancet* 1920 31 875

A detailed record of this case of pneumothorax and lung abscess is presented because it contained an intricate problem of diagnosis.

The infant was male aged eight weeks. It had been well until ten days previously when it developed paroxysmal cough. During the attacks of coughing it became blue and breathless. Roentgenography showed an air-containing space occupying the greater part of the left chest. The mediastinum was displaced to the right. A needle was inserted into the left side of the chest and air escaped under pressure. There was hyperresonance with absence of breathing sounds over the left chest. Further roentgenography showed that the collection of air did not reach the left periphery. The lateral view suggested that coils of the intestine were present in the left pleural cavity. The condition was thought to be a large pulmonary cyst rather than pneumothorax.

At operation a cystic space was found. The lung was collapsed. A head of pus was seen escaping from a small bronchus cavity in the lung where the lower lobe joined the chest wall. There was no fluid in the pleural cavity. The baby died on the following day.

At necropsy it was found that the upper lobe was necrotic whereas the lower lobe was collapsed and hemorrhagic and contained multiple whitish areas. In one of these there was a small bronchus cavity which had ruptured through the pleura. Cultures from the pus and from the lung yielded pure growth of staphylococcus aureus.

J. D. VAN WITKAMP, M.D.

Atoll, D.: Cancer of the Lung and Specific Inflammatory Processes (Cáncer del pulmón y procesos inflamatorios específicos). *4 de la Revista de patología y clínica de la tuberculosis* 1919, N. 2, p. 167

The coexistence of bronchopulmonary cancer and specific inflammatory processes, such as tuberculosis, syphilis, and actinomycosis, has been the subject of many serious discussions. The first observation of cancer in pulmonary tuberculosis as reported by B. J. in 1800, but any attempt to associate them was denounced by Rokitsky a few years later.

Pearl reported in 1909 that in a series of 6,670 necropsies, it was observed that half of the cases of pulmonary cancer presented tuberculous cicatrices, while only 6.6 per cent of the total number had forms of developmental tuberculosis. Pearl stated that the ratio of the developmental form associated with cancer to the cicatricial form as to Carbow and Bell, reporting 95 topices, came to the same conclusion.

Observations of cancer originating in the pleural cavity have been made by many investigators, in

cluding Ayet and N. Vac, Borch, Bernard, Breck, Wolff, and Sch. Alb. T. Title and Womack do not believe in the development of cancer in the pleural cavity for these authors, in all of their published observations, state that all of the cancers are primary bronchiogenic lesions with secondary bronchiectasis. The author disagrees with this point of view and believes that their Case 2 is an authentic one of malignant degeneration of the wall of a tuberculous cavity in which the tumor had its origin in the bronchus proximal to the area and later invaded the wall and grew into the lumen.

Experimental work has shed very little light on the problem. The development of cutaneous cancer over an old lupus cicatrix is proved, but it has not been demonstrated that pulmonary tuberculosis is capable of favoring the growth of cancer in the lung. Moise has called attention to epithelial metaplasia in all of these cases of acute or chronic inflammatory processes and has noted sclerosis as sequel. Metastatic and Ribbert believed that these sclerotic nodules played an active part in the genesis of the tumors.

Wintermiz, Smith, and McNamara found that the regenerative picture of bronchial mucosa in rabbits, following destruction with hydrochloric acid, often resembled the chronic inflammatory process in man and sometimes resembled malignant epithelial tumors. Haythorn noted that the metaplastic transformation of bronchial mucosa has stratified pavement epithelium, which may be observed in chronic inflammation in man, is always accompanied by alterations in the basement membrane.

Eddy, Schmidt, McCulloch, and Dalldorf have produced metaplasia of the bronchial mucosa in rats with diet poor in vitamin A and injections of large doses of thelin, of such magnitude to include the human.

Wolf believes that bronchiogenic tumors often originate from cicatricial lesions of the mucosa secondary to the eruption of tuberculous lymphatic nodes, and gives this as the reason for their usual hilar location.

Title and Womack do not believe in the malignant transformation of the metaplastic epithelium. Among 76 cases of bronchiectasis studied, bronchiogenic cancer was observed only in 1 instance. These authors consider the metaplasia observed in the inflammatory processes as a medium of protection of the tissues against microbial attack, and not precancerous. Experimental Tuschlander has demonstrated that the Koch bacillus possesses the power of immunization against the sarcoma of fowls.

Among a total of 56 cases of bronchopulmonary cancer the author observed the simultaneous existence of tuberculous changes in 8 cases, the association with pulmonary syphilis in 7 and the association with actinomycosis.

In regard to the author states that he believes that the tuberculous cicatrix precedes the cancer in these associated cases and in no way inhibits the develop-

ment of the latter. The cachectic neoplastica could awaken inactive tuberculous lesions. He could not consider the tuberculosis of etiological significance except in a very small number of cases, and then more as a chronic, irritative, metaplastic process than as a true etiological agent.

IRANK McDOWILL, M D

Hammond, A. E. The Diagnosis and Treatment of Carcinoma of the Lung with a Statistical Review of 40 Cases. *Arch Otolaryngol*, 1940, 31: 780

From the review of 40 cases of carcinoma of the lung, the following conclusions concerning the various factors are drawn by the author:

1. Sex incidence. The ratio, 4 men to 1 woman, is a finding which coincides with that of other investigators. The higher rate in the male sex is explained on the basis of excessive use of tobacco, the tar from the combustion acting as a carcinogenic element. Other irritative elements, such as chemical, mechanical, bacterial, thermal and radio active agents, may also contribute.

2. Age incidence. The highest age incidence was between forty and sixty years, representing 72.5 per cent of the series.

3. Symptomatology. It was found that in order of their frequency the most important clinical symptoms were cough, pain, loss of weight, hemoptysis, dyspnea, and hoarseness, the cough occurring in 100 per cent and the hoarseness in 10 per cent of the cases, with the remaining symptoms occupying positions between the two.

4. Diagnostic procedures. The physical signs appeared of vague topographic value in a restricted number of cases. The roentgen findings on the other hand, although not infrequently permitting a more precise morphological estimation of the process especially of the secondary complications, gave rise to deductions which often made an exact differentiation from other intrathoracic lesions difficult, if not impossible. Thus, bronchoscopic study, by force of circumstances, remained the sole and indisputable diagnostic procedure in nearly all of the cases.

5. Pathology. The pathological survey clearly showed that the grading of the tumors according to malignancy index appeared of little value as far as the estimation of the final outcome in the individual cases was concerned.

6. Therapeutic procedures. These included surgical intervention in 6 cases and irradiation therapy in 26 cases, the latter method of treatment being given either in the form of a combination of roentgen therapy and intrabronchially applied radium (11 cases) or in the form of roentgen therapy alone (15 cases). None of the patients treated by surgical procedure survived the nine month period. Of the patients treated by irradiation, 4 apparently have been cured, and for others some prolongation of life with more or less satisfactory palliation was obtained. The conditions of all of the patients who were apparently cured were in the early stage, and the good results were brought about by the combi-

nation of roentgen irradiation administered externally and intrabronchially applied radium.

JOSPH K. NARAT, M D

Zschau, H. The Applicability of Pedunculated Muscle Flaps in the Operation for Residual Empyemas and Indirect Bronchial Fistulas (Ueber die Verwendbarkeit gestielter Muskellappen bei der Operation von Restempyemen und indirekten Bronchialfisteln). *Zentralbl f. Chir*, 1939, p. 2529.

Zschau reports the operative results in 3 patients on whom pedunculated muscle flaps were used in the treatment of residual empyemas and indirect bronchial fistulas. In the first case, there was a fistulous residual cavity following a suppurative hematoma in the anterior region of the fifth rib. Because the removal of the ribs coursing over the fistula would have become too extensive, a small muscle flap formed at the same time was inserted into the fistulous tract—a broadly pedunculated flap which was used for filling of the residual empyema cavity. The clinical result was very good and the patient became fully capacitated for work.

In the 2 other patients there were indirect bronchial fistulas and residual empyemas. Contrary to the rule of first transforming the indirect into direct fistulas by thoracoplasty and of carrying out the excision of the fistula at a second sitting, both patients were operated upon at only one sitting. The muscular flaps were taken as large and broad as possible. Both patients were cured in a few weeks.

These procedures are recommended on the basis of the experiences encountered.

(WILCKFR) LOUIS NEUWELT, M D

Castelo Branco, J. M. A Clinical Study of Cerebral Gaseous Embolism in Thoracopulmonary Surgery (Estudo clinico das embolias gazosas cerebrais em cirurgia toraco pulmonar). *Folha med*, 1940, 21: 74, 90.

Castelo Branco states that syncope, convulsions, and, finally, paralysis are caused by cerebral gas embolism, the complete cycle is rarely seen but often the first or second stages are observed. At times without prodromal signs, at times with preceding amaurosis, formications, nausea, or a vague sensation of ill being, the symptoms appear suddenly, and pallor, apnea, mydriasis, rigidity, and loss of consciousness occur simultaneously. These symptoms which last a few seconds, may disappear without leaving any sequelæ, may change into others, or may end in the death of the patient. They are followed by cyanosis, contractions of the jaws, spasmodic trismus, tonic and clonic convulsions, lamentations, and finally generalized spasms. These crises may return at varying intervals and disappear without sequelæ or end in paralysis or death, especially in cases of subinfrant crises. Consequently, the nervous accidents resulting from the entrance of air into the veins of the small circulation present a decided epileptoid character and a picture of varying

gravity and duration, the symptoms may last hours and even days, but death does not depend on the greater duration. In fact, death may occur suddenly without the described sequence of symptoms on the other hand, patients with subintrant crises, who have been unconscious for hours and days, may gradually improve, regain consciousness, and return to normal, and finally show no sequelae or only minimal sequelae which usually consist of paralysis or paresis limited mostly to the upper extremities. The author describes several cases illustrating the various possibilities which he has discussed. He attributes the sudden death of one of his patients to massive bullar embolism. He disagrees with various authors who have observed isolated phenomena and clinical signs to which they attach decided importance for the diagnosis or the characterization of the nervous syndrome of cerebral gas embolism; these signs and phenomena have little value as diagnostic elements and are only indications of predominant localizations of the embolus and of the ischemic territories in individual cases. In this connection, he mentions mental confusion after the cerebral embolic accident (Brunnerle), sardonic grin (Leuret and Causimmon), hemilateral or triangular anemia of the tongue (Loebmichter) and cyanotic spots on the skin (Brauer) symptoms which he has never or only exceptionally observed.

A review of the literature on the nervous accidents of collapse therapy of pulmonary tuberculosis and of thoracic surgery in general reveals the confusion and the unreliability of the therapeutic measures which are recommended. The same insecurity and even lack of logic characterize the prophylactic measures preconized for these accidents. Consideration of the pathological mechanism of the accidents shows that only those techniques should be used

which protect the patient against risks and, therefore, thoracic or pulmonary punctures, whether for diagnostic or therapeutic purposes, should always be done with a sharp needle provided with mandrel, so that no vessel which might be accidentally entered can come in contact with air. In gaseous collapse therapy various conditions must receive consideration because they permit greater possibilities for the production of cerebral embolism. A rigorous technique is always indicated. The great majority of the accidents are caused by puncture of a pulmonary vein or of vascularized pleuropulmonary adhesions. Therefore, adhesions should first be sectioned by the method of Jacobous or by means of an open operation, and, if this is impossible, the puncture should be made away from the adhesions, or the pneumothorax as well as the partial pneumothorax with positive pressure should be abandoned and the tendency to adhesion avoided.

In the treatment of cerebral accidents, most of the measures that have been recommended are either useless or dangerous. The administration of heart tonics and lactic drugs, the treatment of symptoms, especially of the convulsive crises, artificial respiration and even heroic measures to combat respiratory

syncope and the use of bullar stimulants, such as coramine and lobeline may be useful according to the nature of the cases. Subcutaneous and intracardiac injections of adrenaline are contraindicated and dangerous. Lately the injection of vasodilating substances has been recommended; acetylcholine gave favorable result in one of the author's cases, while 0.005 gm. of ergotamine tartrate administered intramuscularly had prompt effect in another case. However the latter should not be used in cases of surgical shock, which it aggravates.

RICHARD KREUZ, M.D.

ESOPHAGUS AND MEDIASTINUM

Jacobell, D. M. Bases for the Surgical Treatment of Esophageal Varices (Die Grundlagen fuer die chirurgische Behandlung der Oesophagusvarizen). *Deutsche Zeitschrift f. Chir.* 1930, 57.

The author reviews in detail the development and the present status of the question of esophageal varices. The history of the question is described analytically and interestingly. The normal and pathological anatomy is then discussed, and the causes and symptoms of these varices.

In the author's opinion, various treatments are indicated, depending upon the cause and extent of the involvement. The purpose of operation is to interrupt the blood flow from the portal vein into the vena cava, by way of the esophagus, and to establish a new and safe communication in place of the obstructed collateral circulation.

On the basis of experiments consisting essentially of the injection of dyes into the mesenteric cist before and after obstruction of the return flow the author recommends the following operative procedure: (1) interruption of all afferent venous trunks in the lesser mesentery; (2) interruption of the venous afferent trunks in the region of the spleen; and (3) establishment of a new collateral pathway for portal vein blood to the vena cava by means of modification of the Talma operation. For this purpose the greater omentum is sewed into the peritoneal suture line or into the rectus sheath. The author believes that the Talma operation will then offer much greater promise of success, since the return pathways through the varices have been interrupted.

(LUGER) LEO M. ZIMMERMAN, M.D.

Woolley, H. Surgical Treatment of Mid-Esophageal Carcinoma. *Ann. J. Surg.* 1930, 7: 696.

The results of the radiological treatment of esophageal carcinoma have proved disappointing and new interest in the possibility of the surgical excision of such tumors has risen. The high operative mortality in the surgical removal of the esophagus has led to the general adoption of palliative measures, but many unfortunate patients would readily agree to radical operation if there were fair chance of survival. Carcinoma of the esophagus is relatively slow in its growth and the spread to the regional lymph glands occurs late in the disease.

SURGERY OF THE THORAX

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The present article deals only with the mid-esophageal growths. They are usually situated at about the level of the left bronchus and partly behind the arch of the aorta.

The conventional method of approach for removal of the esophagus has been through the left side of the chest, but the author has found that approach from the right side possesses many advantages and renders the operation much simpler. The article is based on 4 cases in which the usual approach through the left side of the chest was employed, but in the last 3 the exposure was through the right side of the chest. It was found in operations on the cadaver that by the division of the vena azygos major close to its junction with the superior vena cava the right lung together with other mediastinal structures could be readily displaced forward and to the left. The esophagus could then be completely exposed and most of the technical difficulties eliminated.

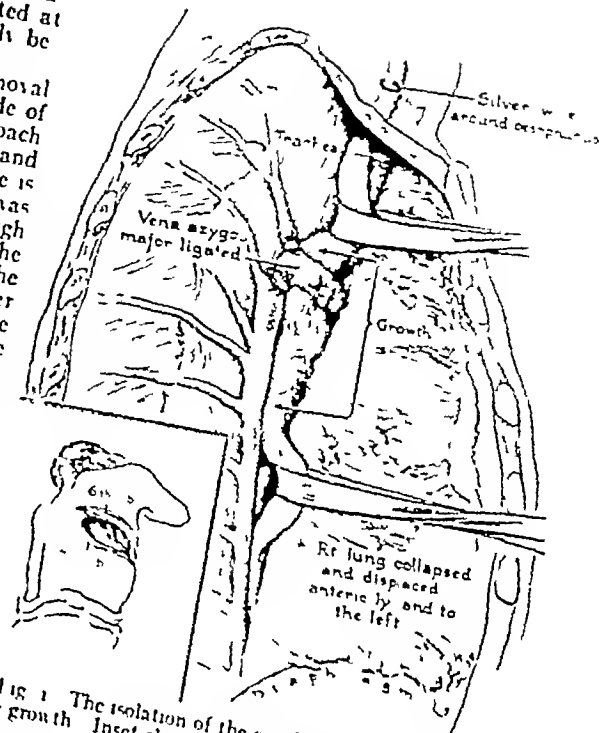


Fig. 1. The isolation of the esophagus above and below the growth. Inset shows method of approach.

The J-shaped tube gastro-tomy was used in 3 cases and a simple jejunostomy in the fourth case. The patient is allowed to recover from this operation and to become accustomed to tube feeding. The general condition of the patient is improved by blood transfusions. Three weeks later the second stage of the esophagus in the left side of the neck. The upper end is mobilized and a loop of silver wire is passed loosely around the esophagus, the twisted ends being brought through the anterior margin of the sternomastoid muscle. The neck wound is closed without drainage. Five days later the third operation is done under intratracheal anesthesia—gas and oxygen or cyclopropane. The patient lies on his left side with his chest supported by a sandbag. His arm is drawn forward and upward and secured to an armrest. A continuous drip transfusion is given throughout the operation. A long incision is made over the seventh inter space just below the angle of the scapula. The seventh and eighth ribs are divided as far back as possible and the pleura is opened along the line of incision. Heavy self retaining retractors are used to spread the ribs which affords ample space for the further steps of the operation.

Any pleuritic adhesions are divided and with the collapse of the lung the vena azygos major is easily seen as it turns forward to enter the superior vena cava. The vena azygos major is divided between ligatures. The right lung together with the mediastinal content is now displaced forward and to the left. A long incision is made through the mediastinal pleura along the right margin of the esophagus. The esophagus is now freely exposed together with the tumor and is quickly divided with a scalpel or removed by the finger.

The esophagus is freed above and below the tumor in a type of jejunostomy and the tumor is completely freed from the surrounding structures. Great care

being used to protect the left bronchus and pleura. Should the left pleura be opened the opening is closed at once. After complete separation of the tumor from the surrounding structures the esophagus in the upper part of the thorax is easily freed by blunt dissection and the loop of silver wire is felt of the great vessels and is very much simpler than the same procedure from the left side of the chest. The esophagus is now divided as low down as possible by cautery and the lower end is ligated, invaginated, and allowed to slip beneath the pleura. The upper end of the esophagus is ligated and a finger still is drawn over it and secured by ligatures to prevent contamination. The opening in the mediastinal pleura is now closed and the chest wound is closed by interrupted sutures passing tenth inter-space in the mid axillary line. The patient is now turned on his back, the neck wound is opened, the silver wire is quickly identified and the esophagus is brought out through the opening in the neck.

Following the removal of the thoracic esophagus a patient may live indefinitely with a gastro-tomy. In some cases the upper end of the esophagus may be corrected to the lower opening by a rubber tube. In others a reconstruction of the esophagus can be done with a skin tube.

J. H. F. NUTT, M.D.

MISCELLANEOUS

Jones, J. C., Doley F. E. and Bellock, L. T. The Diagnosis and Surgical Therapy of Patent Ductus Arteriosus. *J. Thoracic Surg.* 9:30 9 4 J

This report covers 7 cases of ductus arteriosus operated on by the authors. The ages of the patient ranged from four to thirty-one years. Three are males, 4 females. Six were born at term, 1 seven and one half months. Development during infancy was normal. Six had the common diseases of childhood, but none had rheumatic fever or chorea. One patient had undescended testicles and webbing of the toes. One had spastic paralysis of the arms from birth injury. One had had lung disease eighteen years previously. There was no family history of congenital defects or heart disease.

There are no symptoms of cyanosis, congestive heart failure, or edema. All patients are comfortable at rest, but complained of chronic sense of fatigue and dyspnea on exertion. One patient had fainting attack week before admission, and had attacks of frequent tachycardia and dyspnea. Pallor as not striking in any patient, and none had clubbing. All except adult showed a high pulse pressure with low diastolic pressure. The diastolic pressure often difficult to measure exactly. One patient had a classical Corrigan pulse and pycnotic sound over the femoral artery. In all of the patients exercise caused marked increase in the pulse pressure with drop in the diastolic pressure often to zero. In every case the blood pressure higher in the leg than in the arm. A precordial heave as seen in 3 patients, and thrill as present in 6. The first sound at the apex was uniformly normal. In 4 patients the pulmonary second sound as increased, and in the others it could not be distinguished from the mitral murmur. There as continuous murmur in the pulmonary area in all. Enlargement of the heart was demonstrated by the roentgenogram in 6 patients. The electrocardiograms showed no axis deviation, except in one case which exhibited slight right axis deviation. The Q wave in lead III was prominent in 5 cases the R wave was notched in lead I in. The S-T interval as slightly depressed in leads II and III in 3 cases, and the T wave in lead I was inverted in one case.

Operation done under cyclopropane and nitrogen anesthesia administered through an intra-tracheal tube. Different incisions are employed in the males. In the female a midline incision is made along the

second intercostal space from the parasternal to the anterior axillary line. In the female a submammary incision beginning at the third costal cartilage and curving beneath the breast and upward to the mid-axilla at about the fourth rib. Utilized for cosmetic reasons. The second and third cartilages are excised. The intercostal vessel are double ligated and divided. The collapse of the lung exposed prominent pulmonary conus. The mediastinal pleura as incised 1 cm. behind the left phrenic nerve and 10 cm. below the arch of the aorta. The mediastinal pleura long with the phrenic nerve, as retracted forward and downward. The ductus as then dissected and blunt neuremys passed around it, threaded with silk suture. These ligatures are temporarily tightened until the pulse pressure recorded. When no outward signs appeared they are permanently tied.

All patients are in good postoperative condition. Recovery smooth and without discomfort.

One patient, girl aged thirteen years, had normal convalescence and was discharged on the fourteenth day in good condition. She returned to her normal activities and as apparently well until thirty days after the operation. She then developed fever of 3 degrees and pain between the scapulae. Three days later a high grade continuous murmur in the pulmonary area as found. Blood culture showed the bacterial staphylococcus aureus. Post mortem examination showed the heart to be definitely enlarged in both ventricles hypertrophied. The valves are normal. Between the aorta and the pulmonary artery in the position of the ductus as a stenosis as rounded mass 3 cm. diameter bulging toward the sternum and posteriorly 10 cm. in diameter protruded toward the spine. There as a duple of the aorta at the opening of the ductus this as 6 cm. in diameter and 3 cm. deep and as filled with thrombus, the surface of which was smooth. The lumen of the aorta further thrombus extended from the ductus into the lumen of the pulmonary artery. This orifice was surrounded by friable gray warty vegetations which were adherent to the intimal surface and seemed to split and elevate the inner layer of the wall. The all of the ductus intact for a distance of 3 cm. from the aorta but gradually abruptly and thus formed an aneurysm. This lesion is of great importance of the all of the ductus and reestablishment of the connection between the aorta and pulmonary artery by blood channel.

J. D. M. WILLIAMS, M.D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Wakeley, C P G The Treatment of Certain Types of External Hernias *Lancet*, 1940, 238 822

The author studied the subsequent histories of 2,020 patients on whom he had operated for hernia during the period from 1915 to 1939

The cases were distributed as follows

	No of Cases
Inguinal hernia	1,232
Sliding hernia of the sigmoid	15
Sliding hernia of the cecum	5
Femoral hernia	610
Umbilical hernia	155
Obturator hernia	2
Sciatic hernia	1
Total	2,020

Most cases of indirect inguinal hernia are congenital, only a few being of true traumatic origin. Inguinal hernia is found in three distinct age groups: infants, young adults, and elderly people. In infants inguinal hernia can be cured in some cases with an improvised truss, but in many cases thought to have been cured in infancy, hernia recurs as the patient reaches manhood, when an operation has to be performed. Such cases are not recurrences at all, because the hernial sac has been present all the time and has never been obliterated. The best treatment, therefore, for inguinal hernia in infants is operation. This is simple and requires no reconstruction of the inguinal canal.

In young adults inguinal hernia is congenital and indirect. Trusses and appliances can never cure the condition and only make the hernia larger, because the continued pressure brings about compression atrophy of the abdominal muscles. Operation is the treatment of choice. Whatever the particular operative procedure preferred by the surgeon, it must restore the structures in the inguinal canal as closely as possible to their normal condition. If recurrence is to be prevented, small direct hernias which are so often present must be searched for and treated at the time of operation. In studying a series of recurrent inguinal hernias, the one fact which becomes obvious is that most of the recurrent hernias are direct, although the first operation was performed for an indirect inguinal hernia. The author does not favor the use of fascial grafts for the repair of inguinal hernia and he believes that the results obtained by ordinary operation are uniformly good if convalescence is properly carried out. The patient should remain in bed for at least two weeks after operation, should have a month's convalescence, and should not do any hard work for at least six months.

Nearly all recurrences are seen in the first two years after operation. Table I shows the recurrence

rate found as the result of an extensive follow-up of cases of primary and recurrent hernia.

TABLE I—RECURRENCE IN PRIMARY AND RECURRENT HERNIAS

Type	Total No of Cases	Cases Traced	No of Recurrences	Percentage of Recurrence
Primary	1,140	851	46	5.4
Recurrent	92	59	23	38.6

The author recommends the use of silk suture material.

The results of operation in direct inguinal hernia are not nearly so satisfactory as those obtained in the indirect type, and the recurrence rate is higher. It is important, when operating upon a direct inguinal hernia, to remember that such a hernia consists of a bulging of the posterior wall of the inguinal canal, and any operation for its cure must consolidate the posterior wall and re-form the internal and external abdominal rings. The author refutes the use of fascia-lata sutures. If fascial sutures are used at all, strips of external oblique aponeurosis, cut from either side of the incision in this structure and made when the inguinal canal is opened at the start of the operation, are by far the best. Such strips of fascia retain their connections with the aponeurosis below and can be so crossed as to re-form the pillars of the external abdominal ring. The fascial strips can be used to approximate the internal oblique muscle and conjoint tendon to the deep aspect of Poupart's ligament without causing any strain.

Hernias of the bladder may be divided into three varieties according to the relationship of the hernia to the parietal peritoneum: extraperitoneal, paraperitoneal, and intraperitoneal. The most common variety is the paraperitoneal. The possibility of a hernia of the bladder should always be kept in mind when operation is performed upon a direct hernia.

Femoral hernias must always be treated surgically because it is far too dangerous to apply a truss, which can never be made to fit properly and may cause strangulation. Table II shows the author's results in the treatment of primary and recurrent femoral hernia.

TABLE II—RECURRENCE IN PRIMARY AND RECURRENT FEMORAL HERNIAS

Type	Total No of Cases	Cases Traced	No of Recurrences	Percentage of Recurrence
Primary	535	436	20	4.6
Recurrent	75	51	31	60.7

The author believes, according to his figures, that the high operation or the inguinal route for femoral hernia was responsible for most of the recurrences.

In addition, in a large percentage of cases, a direct inguinal hernia followed this high operation.

In the author's series there are two age groups of umbilical hernia: infants and adults. The results of the follow-up are tabulated as follows:

TABLE III.—RECURRENCE AFTER OPERATION FOR UMBILICAL HERNIA

Group	Total No. of Cases	Cases Treated	No. of Recurrences	Percentage of Recurrence
Infants	95	90	17	17
Adults	57	45	2	2

In infants, simple excision of the umbilical hernia is all that is required for cure; no reconstruction whatever being necessary. Mayo operation for umbilical hernia in adults is best. This procedure gives excellent results with low mortality.

SAMUEL H. KLEIN, M.D.

GASTRO-INTESTINAL TRACT

Church, R. E., and Hinton, J. W. The Results of Gastro-Enterostomy in Gastric and Duodenal Ulcers. *Surgery* 940, 7 647

The results obtained as well as the method of study used by the essayists in 66 cases of gastro-enterostomy on an average of seven and one tenth years after operation, are significant.

The patients made a total of 594 visits to the clinic, an average of 5.4 visits each. Any merit this report may have lies in (1) continuous personal contact between the patient and physician which resulted in the recording and studying of all complaints, and (2) the frequency of roentgenological studies. Church and Hinton have adopted the policy of making roentgenological examinations of each patient every six months. This personal follow-up method showed that statistics obtained by correspondence are of questionable value. For example one patient in the series reported himself in a letter as "well," but the reports of another hospital showed re-operation for recurrence. When the results are unsuccessful the patients do not return and do not respond to follow-up letters. Experience in this study has shown that the patients must be traced to their homes at frequent intervals if accurate data are to be obtained.

This material of 66 patients contained 66 males and 1 female with an average age of thirty-eight years and pre-operative ulcerations for five and six tenths years. About 4 per cent of the patients were Irish Italians or Roumans. There are 64 duodenal and 2 gastric ulcers, the site of the ulcers in 3 patients not being given.

The indications for surgery were as follows: severe pain, obstruction, perforation, pain and obstruction, pain and hemorrhage, obstruction alone, pain, hemorrhage and obstruction, hemorrhage alone and obstruction and hemorrhage. Malignant degeneration is a definite threat in all ulcer patients and although it may be considered an indication for sur-

gery the authors were not very enthusiastic in using this as a compelling cause for operation.

The results of surgery showed that 45 per cent of the patients could be considered cured and 39.2 per cent benefited, which makes a total of 53.7 per cent who were benefited. Forty-six and two-tenths per cent were not benefited, however, and 17 or 6 per cent of this group required secondary operation for recurrence of symptoms. Of the 106 patients, 20 or 3.3 per cent had proved gastric ulcers with an average time of appearance of three and one-half years. Hemorrhage occurred pre-operatively in 15 patients (14.2 per cent) but 91 of the operated patients who did not have pre-operative hemorrhage 15 (16.9 per cent) subsequently had postoperative hemorrhage. In 9 cases of obstruction treated by gastro-enterostomy 8 (42 per cent) were cured, 4 (1 per cent) were benefited, and 37 per cent were not benefited. This obstructed group included 3 cases of marginal postoperative ulcer, an incidence of 5.6 per cent.

The authors conclude that the results in their series did not produce so favorable a view of this operative procedure as is generally presented by other authors, presumably because of the longer follow-up period adopted. SAMUEL J. FOULSON, M.D.

Payne, R. T. Cancer of the Stomach as a Surgical Problem. *Brit J Surg* 940 17 740

This article is a survey of the problem of cancer of the stomach mainly from the point of view of the surgeon.

The author first discusses the incidence and importance of the disease. For this form of cancer as for the greater number of other forms the statistics of most countries show a considerable rise in incidence during recent years. It is difficult to determine whether or not there has been any true increase in incidence, since it is certain that the greater accuracy in diagnosis and in the compilation of mortality tables and the increase in the population living beyond the age of forty years have all been contributory factors in the apparent increase. This increase in incidence has been shared equally by the sexes. Cancer of the stomach becomes increasingly frequent with age. The occurrence of gastric carcinoma is approximately equal to the combined incidence of cancer of the large intestine and of the rectum.

With a disease of such frequency, the question of treatment becomes an urgent one. In the opinion of the author surgery in the form of either partial or complete gastrectomy offers the only possibility of cure. Other methods of treatment such as radiotherapy or the use of lead and other chemicals can only be regarded as experimental or palliative and they have not been responsible for cures.

The problems of the pathology and pathological physiology of carcinoma of the stomach are then reviewed. These include the morbid anatomy, metastatic involvement, general nutrition, vitamin deficiency and fluid balance, also dehydration, achlorhydria, hypochloremia, azotemia, and anemia. Gas-

tric cancer must be regarded not only as a local malignant process with all the characteristics of malignant disease, but also as a disease process which, by interference with the fundamental and diverse functions of the stomach, may profoundly influence nutrition and metabolism as a whole.

Attention is drawn to the protean and vague nature of many of the early symptoms. There is no one symptom or group of symptoms which is necessarily characteristic of cancer of the stomach, and this is an important factor in the difficulty of early recognition of the disease. Every case of "indigestion" arising in patients more than forty years of age should be subjected to detailed clinical investigation if early diagnosis is to be accomplished.

The author analyzes a series of 506 cases of gastric carcinoma, and discusses various surgical problems involved in the treatment of the disease.

The number of five-year cures reported in the literature at the present time represents but a small proportion of the cases of cancer of the stomach. However, earlier diagnosis and radical operation in a larger percentage of the cases should produce an improvement in the mortality rate.

SAMUEL H. KLEIN, M.D.

Yannicelli, R. B. *Intestinal Occlusion in the New-born and Sucklings. Clinical and Roentgenological Aspects* (La oclusión intestinal en el recién nacido y el lactante. Algunos aspectos clínicos y radiológicos). *An. Fac. de med. de Montevideo*, 1940, 25, 384.

The diagnosis of intestinal occlusion in infants presents great difficulties because the interpretation of the four classical symptoms, pain, vomiting, abdominal distention, and constipation, may be erroneous. Bilious or fecal vomiting points to a correct diagnosis. Diffuse distention of the abdomen frequently occurs in sucklings and is therefore of a minor diagnostic value, but circumscribed distention is highly suspicious. Visible peristalsis is an early sign of intestinal occlusion. A barium enema frequently helps to establish a correct diagnosis. Accumulation of air in the intestines, visible in roentgenograms, is a physiological phenomenon in newborn and sucklings, but a steadily increasing amount of air points to a mechanical occlusion. Vomiting in a newborn, accompanied by the expulsion of meconium, calls for an immediate roentgenological exploration. Intestinal colics in a suckling, more frequent or more intensive than those occasionally seen in a normal infant, suggest the possibility of an intussusception, and the diagnosis in such cases should be verified by fluoroscopic and roentgenographic examinations.

JOSEPH K. NARAT, M.D.

Wolff, S. *Recurrent Ileus* (Rezidivierender Darmverschluss). *Ann. paediatr.*, 1940, 154, 211.

Poynton published an article in 1924 entitled "A Lecture on Acetonemia and Volvulus of the Small Intestine in Childhood" (*Lancet*, 1924, I, 1045), in which he reports the cases of 7 children at the ages

of from three to seven years, whose cardinal symptoms were repeated attacks of severe vomiting, violent abdominal pains, marked obstipation, and acetone in the breath and urine. The first case with acetonemic vomiting ended in death. Of the remaining 6 cases, 5 ended in death. These proved to be instances of volvulus of the small intestine, as autopsy on 3 of the patients and operation on 2 others demonstrated. In these cases acetonuria is frequently merely a symptom. The article by Poynton is especially significant in that it shows that volvulus may occur in children and lead to violent, repeated crises, and then disappear again.

A case report is given of a case in a female child who originally presented typical manifestations of appendicitis. Upon opening of the abdomen, exudate was uncovered, the cecum itself was long and showed only light adhesions. Recovery followed the operation. A month later, however, there developed, despite the removal of the appendix, renewed indefinite abdominal attacks, this time of longer duration. The abdomen was extremely painful. Because of a suspicion of adhesions the child was reoperated upon under ether narcosis. Upon opening of the abdomen large quantities of exudate appeared under pressure. There were no characteristic findings other than marked reddening and swelling of the outer surface of the intestines, however, the presence of a so called internal hernia in the region of the valve of Bauhin was determined. This was loosened. Three days later, because of the continued attacks of vomiting the child was reoperated upon under the suspicion of ileus. An abdominal anus was made in the region of the wound. The next day large quantities of stool were evacuated through the artificial anus, with subsequent recovery of the intestinal function. Months later the artificial anus was closed. Complete recovery of the child took place eventually.

(H. VIETHEN) JOHN W. BRENNAN, M.D.

Gabbianelli, L. *Two Cases of Lipoma of the Small Intestine* (Su due casi di lipoma dell'intestino tenue). *Policlín.*, Rome, 1940, 47, sez. chir. 181.

Gabbianelli describes 2 cases in which recurring attacks of abdominal pain, and the presence of an elongated swelling in the upper right quadrant in 1 case, led to surgical exploration. A lipoma, the size of a pigeon's egg and located at the junction of the mesentery with the small intestine, was found to impinge on the intestinal lumen in the first case, and an easily reducible invagination of the small intestine, due to the presence of a lipoma the size of a nut and located on the side opposite to the mesenteric insertion, was discovered in the second case. Resection of the intestine was necessary in both cases.

Lipoma is one of the rarest forms of benign tumor of the gastrointestinal tract, it develops usually in the colon and infrequently in the small intestine, it is generally submucosal, at times subserosal, and the muscular wall seems to constitute an impenetra-

ble barrier. Nevertheless, the Epomias in the present cases are decidedly subserosal and subserosal at the same time. Lipoma is usually single and sessile rarely peduncular and may vary greatly in size. The symptoms depend less on the volume of the lipoma than on its location and may range from those of cut ileus caused by invagination to those of progressive obstruction. Intussusception is not characteristic of Epomias of the small intestine in which the tumor itself in most cases does not cause any symptoms but it is frequent in the colon. Here in addition the tumor gives rise to prodromal symptoms which lead to adequate treatment before the accident occurs.

The symptoms of duodenal lipoma vary with the location of the tumor and may be those of pyloric stenosis, or they may simulate those of Vaterian cancer. Gastric lipoma may cause signs of stenosis if it is located in the vicinity of the pylorus. In the colon the presence of lipoma may be marked by alternating attacks of diarrhea and constipation.

Lipoma has rarely been found on palpation but an invagination tumor has been felt in some cases. In invagination of the small intestine is facilitated by its active peristalsis, its mobility, the length of its mesentery, and the thickness of its muscular layer. In some patients with lipoma of the colon, the first symptoms may date back several years. Malignancy of the tumor is then excluded by the absence of cachexia, the persistence of canalization, and the blood picture. Roentgen examination may be important for the diagnosis of lipoma of the stomach because the filling defect is clear-cut and the peristalsis and mobility of the stomach are preserved. Roentgenography will not reveal subserosal lipomas in the small and large intestine but may provide useful information in case of complications. Invagination by itself contraindicates thorough investigation once its diagnosis is established.

The etiopathogenesis of intestinal lipoma is still obscure. It is benign tumor but complications may give it an unfavorable prognosis. Obstruction is to be feared most and may be caused by the mechanism of invagination, rarely by that of volvulus. Hemorrhage perforation with consequent local or general peritonitis, and even spontaneous elimination of the lipoma have been reported. It is impossible to diagnose intestinal lipoma as a pre-operative finding. The treatment consists of enucleation with enterostomy or resection.

RICHARD KRIEGL, M.D.

Bunch, G. H., and Doughty, R. G. Chronic Obstruction of the Proximal Duodenum by Congenital Bands. *Ann Surg* 1940 739

Three cases of obstruction of the first and second portions of the duodenum by fibrous bands are presented. This condition is more common than generally thought. The bands are congenital anomalies, probably remnants of the anterior mesogastrium. They cross the second portion of the duodenum from below and terminate in the region of the gall bladder.

Differential diagnosis is to be made between this condition and trends of the intestine and also between it and congenital pyloric stenosis. In the case of atresia differential diagnosis is impossible pre-operatively but congenital pyloric stenosis can usually be differentiated from obstruction due to bands because of the fact that patients with the latter start vomiting after the first feedings, have bile in the vomitus and present no typical olive-shaped abdominal mass.

Because of flattening constriction, no angulation of the duodenum due to the bands the proximal duodenum does not become dilated. The obstruction may be complete or incomplete; the former type requiring immediate operation, the latter usually pursuing a chronic course over many months or years with intermittent vomiting and chronic starvation. One of the cases was of the complete, of the incomplete variety.

Operative technique consists of division of the bands on the outer avascular margin of the duodenum. Pre-operative and postoperative management is similar to that in cases of congenital pyloric stenosis except in the older patients. The authors are of the opinion that many cases of incomplete obstruction go unrecognized for years and that surgical exploration is indicated in patients with symptoms of high obstruction who do not respond to dietary management. RICHARD WARELY, M.D.

Ducuing, J. Recovery Following Operation in Case of Diverticulum of the Duodenojejunal Angle. (Du cruralis opéré et guéri de l'angle duodéno-jejunal). *Presse méd* Paris 1940 45 37

The author reports a case of diverticulum of the duodenojejunal junction in a fifty-three-year-old man. The previous history was not significant. The patient suffered from epigastric cramps which were particularly severe two hours after meals. His appetite was good but he lost 7 kgm. in weight during the last 2 months. Examination revealed tenderness in the right hypochondrium and epigastrium. Roentgenological study following barium meal revealed triangular shadows at the level of the intervertebral disk between the third and fourth lumbar vertebrae. In the oblique position the apex of the triangle which was directed inferiorly seemed to be connected to the duodenum at the duodenojejunal junction by a narrow band of barium. A diagnosis of diverticulum of the duodenojejunal angle was made.

Laparotomy was done under ether anesthesia and exploration revealed the diverticulum with its opening to the posterior superior wall of the duodenum at the duodenojejunal angle. The diverticulum was resected, and the posterior parietal peritoneum and the opening of the gastroduodenal omentum were repaired. The postoperative course was unremarkable and the patient was discharged as cured on the fifteenth postoperative day.

The resected diverticulum was about 4 cm in length and about 1 cm in diameter. Histological

examination revealed glandular mucosa of a normal duodenum with a thin muscular layer except near the orifice where it appeared slightly thicker than normal

MICHAEL DEBAKEY, M D

Huruya, S The Permeability of the Intestinal Wall for Bacteria, Especially In Circulatory Injury of the Colon (Beiträge zur Frage der Durchlässigkeit der Darmwand fuer Bakterien, besonders bei zirkulatorischer Dickdarmschädigung) *Arch f klin Chir*, 1939, 197 211

By means of animal experiments the attempt was made to determine under what conditions and at what time the colon, injured by interruption of the vascular supply of the mesocolon and ligation of the mesentery, becomes permeable for bacteria. After division of one or several blood vessels in the ascending mesocolon by means of a median laparotomy in adult rabbits, the abdominal cavity was again opened at another site twelve hours after the operation under the strictest asepsis, and then smears from the surface of the serosa were made every two hours up to twenty-four hours for the bacteriological investigation. The findings were as follows:

Relatively often, directly after the operation, bacteria (mostly the staphylococcus albus) were demonstrated on the surface of the serosa both in smears and culturally, these were considered to be of ecogenic nature. They were introduced at the operation and were no longer demonstrable after twelve hours. With the division of a blood vessel of the ascending mesocolon, a partial necrosis of the intestinal wall frequently resulted within twenty-four hours. However, during this time bacteria did not penetrate through the intestinal wall into the free abdominal cavity. If two blood vessels of the ascending mesocolon were divided, complete necrosis of the intestinal wall resulted soon after fourteen hours and within from fourteen to sixteen hours after the operation intestinal bacteria were already present on the intestinal serosa. They increased in number with the passage of time and could be demonstrated abundantly after twenty-four hours. In various cases, however, the surface of the serosa of the necrotic intestinal wall remained perfectly sterile. There was no basic difference between the conditions following the ligation of two and of more than two blood vessels of the ascending mesocolon. Necrosis of the intestinal wall and penetration of the intestinal bacteria occur somewhat earlier (ten to twelve hours) with the division of more than two blood vessels.

By means of histological investigations, it was shown that the penetration of the bacteria, which always follows the onset of the necrosis early, occurs essentially by way of the lymphatics. The blood vessels always remained free of bacteria. The author thinks that the possibility of the penetration of the intestinal bacteria is generally overestimated. With slight injury of the tissues the necrosis of the intestinal wall as a result of section of the blood vessels of the mesocolon with ligation of the mesentery

definitely does not always injure the intestinal wall uniformly in its entire thickness, sometimes it is injured in its entirety and sometimes only in certain areas—the penetrating bacteria could never be demonstrated in the acute experiment. The kneading and massage of the portion of the intestinal wall separated from the mesocolon also could never bring intestinal bacteria into the abdominal cavity within four hours.

(WELCKER) LOUIS NEUWELT, M D

Koucky, J, and Beck, W C Acute Non-Malignant Perforations of the Colon *Surgery*, 1940, 7 674

Perforations of the colon into the free peritoneal cavity, excluding malignant lesions, are fortunately rare in occurrence. However, since they happen with sufficient frequency, their immediate diagnosis is most important. In the following discussion, the writers include only those perforations resulting from intraluminal sources. The most common cause is one of the complications of diverticulitis, foreign bodies, acute elevation of intracolonic pressure by enemas, or the occasional "compressed air injury."

Six cases are detailed to indicate that acute perforations of the colon occur often enough to warrant consideration of this possibility in all obscure cases of peritonitis. A previous diagnosis of colon diverticulum may often point to the correct diagnosis. In the early cases the peritonitis may be observed to originate about the descending colon, while in the late cases the picture is one of diffuse generalized peritonitis. The onset may be as sudden as that of a perforated peptic ulcer. Routine laboratory tests are of little value. X ray studies, especially as regards the presence of pneumoperitoneum, are often of value. The use of the barium enema in colon perforations is contra indicated because of the chance of spill into the general peritoneal cavity.

Treatment must depend upon accuracy in diagnosis. The subacute perforations or those with limited leakage are best treated conservatively. Attempts at closure would seem to be justified in some acute perforations. Perforations due to disease do not permit accurate closure, because of the marked inflammatory reaction about the opening. In these, some type of exteriorization may be indicated. Drainage of the damaged segment, with or without colostomy above, may be the method of choice. Colostomy without exploration or any handling of the perforated bowel has resulted in recovery and is probably the procedure of choice. JOHN W. NELSON, M D

Qucnu, J, and Lignon, P In Defense of Delayed Resection after Exteriorization for Segmental Resection of the Colon in Cancers of the Left Colon (Défense de la résection différée après extériorisation pour la colectomie segmentaire dans les cancers du colon gauche) *J de chir*, 1940, 55 4 3

Qucnu and Lignon state that in 65 cases of cancer of the left colon which were operated upon, exteri-

zation of the involved segment of the colon and resection after delay of several days were done in 4 cases. The technique employed was that of E. Quenu as described by Croet in p. 4. In 38 cases no resection operation was attempted on account of the extent of the lesion. In 17 cases resection was done by other method. In 11 of these the cancer was in the rectosigmoidal area, which naturally there is no possibility of exteriorization.

The technique used in the 4 cases involved three stages. I the first stage the segment of intestine that as the site of the tumor was exteriorized the 3 layers of the mesocolon, left and right were sectioned without injury to the blood vessels or glands each of these layers was sutured to the corresponding surface from which the parietal peritoneum had been separated. Sutures were placed around the vascular pedicles. The afferent and efferent loops of the exteriorized segment were sutured in the incision in the abdominal wall and compresses were placed around the exteriorized segment. In this way the intestinal segment was outside of the abdominal wall and the vasculolymphatic pedicle outside of the peritoneum. II the second stage, from five to seven days after the first, the sutures placed around the vascular pedicle were tightened to secure hemostasis and the segment of intestine and vasculolymphatic pedicle were sectioned. The 2 ends of the intestine were partially sutured in their posterior circumference. III the third stage, after varying intervals, the artificial anus was completely closed by suture of the anterior circumference of the intestinal segments.

All of the 4 patients operated upon by this method made good postoperative recovery without complications, although half of them were more than sixty years old. This indicates that the operation is unusually well tolerated, and this is because it is entirely extraperitoneal. I the first stage either the intestine or the vasculolymphatic pedicle is cut the space in which this operation is to be done is merely prepared. B delaying the resection operation the intra-abdominal, but extraperitoneal, surface partially heals its walls are covered with fibrin and later the granulations at the base of this cavity is the intestinal segment and its vasculolymphatic pedicle. They also are covered with granulation tissue thus the intestine can be opened and the lymphatics sectioned without danger. The means of hemostasis are provided by the sutures placed in the first-stage operation and there is very little bleeding. The first stage is the most important.

In this operation in 11 of the cases included among the 38 which resection was not done the exteriorization of the colonic segment was carried out, but the patients died. I of these cases the tumor of the colon as found at operation for malignant ovarian tumor and subtotal hysterectomy was done before the exteriorization of the colon. Death due to bronchopneumonia and is to be attributed to the hysterectomy rather than to the exteriorization of the colon. In the second case the

tumor was very large and infected. In the process of mobilization, which was difficult, some of the infected glands broke down, and caused peritonitis. This case as definitely inoperable. As no resection of the colon was done in these cases, they have not been included in the authors' statistics of colonic resection. If they are included in the exteriorization operations, the mortality is 12 per cent (deaths 12, 16 cases). If they are not included, there is no postoperative mortality in 4 cases.

Of the 4 patients who were discharged from the hospital after operation, could not be traced. A woman sixty years old, with Pott disease and hemiplegia, died suddenly two months after discharge. Of the remaining 3, 6 died from two to nine years after operation. In 2 of these cases death was certainly not due to recurrence of the cancer of the colon. I another case death was probably not due to recurrence. In 3 cases death was known to be due to recurrence, and in a third case was probably due to recurrence. These 3 deaths all occurred in the course of the second year after operation. Of the 6 surviving patients 4 are living and free from recurrence more than 10 years after operation, the other patients less than 10 years. In all of these living patients, the artificial anus has been successfully closed.

ALICE M. WATSON

Grasso, R. A Clinical Contribution to the Knowledge of Haastrocecal Invagination (Contributo clinico alla conoscenza della invaginazione ileocecale). *Falidia*, Rome 1945, 47, 48, 49, 50, 51.

Grasso describes the case of a boy aged fourteen years, who presented the clinical symptoms of acute appendicitis and was found to have an invagination of the second segment of the cecum opposite the ileocecal junction. The invaginated segment was easily reduced and as found to be thickened, pale, edematous, with a gelatinous aspect, and some hemorrhagic stippling, and lardaceous on palpation. The remaining parts of the cecum and the last loop of the ileum were normal. Appendectomy and cecopexy were done. Recovery was uneventful.

This was, consequently, a case of typical and recent partial or parietal haastrocecal invagination, of which only a few cases have been reported. As several cases have been described by the same author it is hard to believe that the disorder is as rare as it appears to be from review of the literature. Anatomically it consists of lateral invagination of one of the first three segments of the cecum between the anterior and the posterolateral longitudinal bands. Partial invagination of the appendix may accompany that of the first cecal segment. The invaginated part undergoes circulatory disturbances and may become gangrenous, which causes a syndrome absolutely similar to that of acute appendicitis. The symptom in favor of invagination could be the sudden occurrence of this syndrome with signs of obstruction, the absence of fever and the rapid presence of painful cylindrical swelling in the right iliac fossa. Unfortunately the signs are vague

and all symptoms may be absent. However, the differential diagnosis has no practical importance, as both disorders require immediate surgical intervention. A case has been reported in which the invagination caused a syndrome of chronic subocclusion. Roentgen examination might help to establish the diagnosis, but has not been used in any of the reported cases because of the urgency of the syndrome. Youth, and mobility of the cecum and all other anatomical changes of the cecum and of its portion of the mesocolic ligament have been cited as predisposing factors. Various interventions have been used by the various authors to suit individual cases. All patients have recovered and no recurrences have taken place.

RICHARD KEMEL, M.D.

Sovena E. Invagination of the Haustra of the Cecum (Sulle invaginazioni delle haustra del ceco) *Poliedin*, Rome, 1940, 47 sez. chir. 142

The author reports 2 cases of invagination of the cecal haustra, describes the clinical and anatomical manifestations, and reviews the literature.

A twenty-year-old woman was seized with epigastric pains which later localized in the right lower quadrant. There was no fever, nausea, or vomiting. The clinical diagnosis was acute appendicitis. At laparotomy the cecum was found to be invaginated into the first part of the ascending colon. When this was corrected by manipulation, it was discovered that the first haustrum of the cecum was invaginated between the anterior and posterolateral tænia. Since the wall of the cecum was thickened, congested, and edematous, and since there was a tendency of the invagination to recur, a right hemicolectomy was done with a lateral anastomosis of the ileum to the transverse colon. The patient made an uneventful recovery. Upon removal of the cecum it was noted that the haustrum contained some trichocephali which were the cause of the invagination. There were numerous small ulcers throughout the mucosa of the cecum. The appendix was normal and showed no inflammation on histological study.

In reviewing the literature the author quotes Kviovsky as to the etiology: the predisposing factor is a mobile cecum, the immediate exciting factor may be ulcers, tumor, foreign body, spasm, or inflammation. In his own cases Kviovsky reported an accumulation of oxyuris in the cecum as the cause. In the author's 2 cases the occurrence of trichocephali which caused ulceration in the cecum and even burrowed into the cecal wall were the immediate cause of the invagination. The author ascribes the greatest rôle to intestinal parasites, which he discusses in detail.

JACOB L. KLEIN, M.D.

Goyena, J. R., Itoiz, O. A., Niño, F. L., and Bosch Arana, G. The Diagnosis and Treatment of Acute Appendicitis (Diagnóstico y tratamiento de las apendicitis agudas) *Rev. Soc. med. argent.*, 1940, 54: 229.

GOYENA states that the early diagnosis of acute appendicitis is urgent because the immediate treat-

ment and the prognosis depend on it. Pain is generally the first symptom to appear, vomiting, constipation, and fever combine with it to make the patient seek medical advice. The physician immediately suspects an acute abdominal process and particularly appendicitis, but should not forget that many other diseases may produce a similar picture. Examination of the patient will provide the elements to establish the diagnosis, his general condition will vary with the clinical type of the disease and his pulse will give valuable information on this point. Induced pain is never absent and its site will depend on the localization of the diseased organ, it may even be found in the left iliac fossa or in the cul de sac of Douglas. The induced pain is associated with hyperesthesia and often hyperalgesia of the skin. The abdominal reflexes may be decreased or absent. The most significant sign is abdominal defense, which, however, may be absent as a result of muscular fatigue or of the grave general condition of the patient, on the other hand, if the appendix is located posteriorly, the defense may be found in the lumbar muscles. There may be dissociation of temperature and pulse, especially in complicated cases, and the temperature may be normal or subfebrile in the axilla but high in the rectum.

Itoiz discusses the pathological anatomy of acute appendicitis, which includes two distinct intestinal diseases: inflammation of the wall and occlusion of the lumen. He distinguishes three different anatomical forms: Catarrhal or congestive appendicitis is the initial form of any variety of the disorder and corresponds to slight attacks, the repetition of which is erroneously called chronic appendicitis by many physicians. There is slight swelling of the organ and dilatation of the subserous capillaries without exudation on the peritoneal surface. The process is limited to the mucosa. Appendicitis is present when histological examination reveals inflammatory infiltration of the submucosa and subserosa. Suppurative appendicitis begins at the bottom of one of the crypts from which the abscess spreads, especially in the loose tissue of the submucosa. The epithelial covering is destroyed only at the points of evacuation of the small abscesses, but these points may fuse together to form an ulcer. Gangrenous appendicitis is due to interruption of the circulation, it may be localized and is then usually caused by compression of the inflamed wall by a coprolith, or it may be generalized and is then caused by embolism or thrombosis of the appendicular circulation or by acute obstruction of the appendix, death from peritonitis is the rule within from forty-eight hours to six days. If perforation occurs in suppurative appendicitis, the focus is usually already isolated from the peritoneal cavity by epiploic adhesions, and a perappendicular abscess forms, if perforation occurs in acute obstruction, the evolution is rapidly fatal. Clinically, appendicitis may start suddenly during perfect health (obstruction), or gradually after prodromal

disturbances lasting several days (catarrhal or suppurative forms) in this case it may regress spontaneously however in three forms may end in perforation and death by cut peritonitis.

Also discusses the bacteriology and serum treatment. Numerous aerobic and anaerobic bacteria have been found in appendicitis but among the aerobes, the bacillus coli is present in 85 per cent of the cases, and among the anaerobes the bacillus perfringens in 30 per cent. The great mass of acquired data reveals (1) the presence in appendices of two types of bacteria aerobic with predominance of the bacillus coli and anaerobic with predominance of the bacillus perfringens (2) the possibility that the primary lesion of the cecum is caused by the streptococcus viridans arising by the circulatory route, with secondary invasion by the complex appendicular flora and (3) the evident part played by anaerobes, and especially by the clostridia in *elchii*, in the acute gangrenous and perforating form of appendicitis, which justifies the use of polyvalent anti gangrenous serum associated with thiocolon bacillus and di-streptococcus serum to prevent the grave complications of the disease and to cure them when they are already established.

BORIS VRANA insists on the necessity of immediate surgical intervention as soon as the diagnosis of appendicitis is made and even in case of doubt. He uses local anesthesia and he advocates percutaneous thoracocentesis to obtain a more complete and prolonged effect. He considers McBurney incision as the best, taking care to cut the peritoneum close to the border of the rectus muscle. Evidences are exceptional and drainage of all parts can be attended under perfect conditions. The incision must be long enough to allow good manual control of the operation. Whenever possible he resects the ileocecal membrane he ligates the base of the appendix and invaginates the stump. In gangrenous and perforated appendicitis, and in localized abscess in which he cannot extirpate the appendix, he drains with rubber tube and gauze. In generalized peritonitis, he uses focal and Douglas cul-de-sac drainage and does not interfere with the appendicular regional process. If the latter suppurates, he intervenes immediately and leaves the entire wound open. He discusses postoperative complications and their treatment: infection of the abdominal wall, generalized peritonitis, fecal fistulae, and a pleuropulmonary accidents.

RICHARD ERICK, M.D.

Dennis, C., Briggs, R. E., Varco, R. L., and Wanger, O. H. Studies on the Etiology of Acute Appendicitis. An Inquiry into the Factors Involved in the Development of Acute Appendicitis Following Experimental Obstruction of the Appendicular Lumen of the Rabbit. *Arch Surg* 94: 4, 929.

The authors have studied the secretory capacity of the cecal appendage, the factors which alter its secre-

tory capacity, and the effect of appendiceal obstruction in 33 rabbits. The following observations were made:

Proof of secretory capacity established by the collection of from 20 to 40 cm. of fluid daily from obstructed, incarcerated appendages.

Obstruction of the cecal appendage by ligation of it has resulted in the development of acute appendicitis distal to the point of ligation. The portion of the appendix which is proximal to this point did not manifest acute inflammation.

3. When the appendiceal base as ligated and the intraluminal pressure as prevented from rising, the characteristic pathological changes could not be demonstrated.

4. Obstruction of the appendiceal base as followed by an increase of the intraluminal pressure. The appendage filled tensely. Areas on the surface blanched and became ischemic occasionally hemorrhagic, and finally gangrenous. After about eight hours rupture of the organ released the tension and as followed by the development of local peritonitis, general peritonitis, and the extensive formation of adhesions. These inflammatory processes are observed through glass windows placed in the abdominal cavity.

5. Preliminary irrigation of the appendiceal lumen did not alter the experimental results.

6. Epinephrine administration produced a diminution of fluid secretion by the incarcerated cecal appendage.

7. The age of the animal had no effect upon the secretory rate of the appendix.

8. Appendectomy as followed by decrease in the secretory rate which however, as inadequate to prevent fatal outcome following closure of the stomach.

9. Previous elevation of the intraluminal pressure produced slowing of the pressure rise in subsequently obstructed appendages.

Prolonged intraluminal pressure at fluid level produced decrease in the rate of fluid secretion by the obstructed incarcerated appendix.

The administration of cathartics did not significantly alter the course of the disease although the average period of survival was longer in animals which received croton oil or castor oil than in the control group.

Operative trauma to the mucosa is not necessary for the development of acute appendicitis in rabbit with an obstructed appendiceal lumen.

From these observations the authors conclude that acute appendicitis following ligation of the base of the rabbit cecal appendage must develop in the following manner:

A rise in the intraluminal pressure increases the tension on the appendiceal wall. Some of the blood vessels are pinched off and foci of ischemic necrosis appear. These foci offer a weakened area through which rupture may occur and provide an open field for an organism which may be present.

EDWARD W. GIBBS, M.D.

Gutch W D, Gery R F and Ballenger F. The Management of Advanced Appendicitis in Childhood. *J. U. S.* 1920 114 1879

In most cases of perforating appendicitis the peritoneum is able to defend itself and to overcome the infection or to limit it in the form of an abscess. In either event delayed operation is a satisfactory method of treatment although the period of illness is usually prolonged and the severity of the complications increased. However, if perforation of the appendix is accompanied by a sudden outpouring of intestinal contents or if rupture of adhesions around a fecal abscess occur, delayed operation may be disastrous. Only by early operation can the presence of the more dangerous types of appendicitis be detected.

The authors report their results in the treatment of advanced appendicitis in 135 children under sixteen years of age. Immediate operation was performed in 119 cases. In 11 of these cases the appendix was gangrenous and perforated. In the remaining 108 cases it was drained without appendectomy. Only 1 patient in this group died, a mortality of 0.83 per cent. This patient's death was not due to peritonitis.

Conservative treatment was given to 16 children. Three of these died, a mortality of 18.7 per cent. All 3 of the deaths were attributed to general peritonitis although the 3 patients were on the whole no more ill than the 1 patient who died on the hospital when they were those who had been treated by immediate operation.

The low mortality which occurred among the children treated by immediate operation is attributed to the use of proper surgical technique and postoperative care. The authors advocate the use of McBurney incision, suction and cautery, and removal of the appendix.

From a study of their results it would seem that appendicitis is no more dangerous in children than in adults although it is sometimes more difficult to diagnose in the former and consequently is more advanced at the time of operation.

EDWARD W. GUTH, M.D.

Haggard W D and Kirtley J A Jr. The Treatment of Acute Spreading Peritonitis Following Ruptured Appendix. *J. U. S.* 1940 114 1543

Many patients with spreading peritonitis following rupture of the appendix are admitted to a hospital in poor condition for surgical treatment. The authors believe that it is a mistake to subject these patients to immediate operation as a matter of routine. Better results will often follow conservative treatment and delayed operation. Dehydration, acidosis, hypochloremia, gastric distention and even circulatory collapse may be present and should be corrected before any surgical procedure is attempted. The following method of treatment is recommended for this type of patient:

1. Nothing by mouth
2. Wangenstein or Miller Abbott tube for intestinal distention
3. Parenteral administration of from 5,000 to 8,000 c.c.m. of 5 or 10 per cent dextrose and isotonic saline solution daily
4. Complete rest of the entire intestinal tract for from five to seven days
5. Small blood transfusions
6. Oxygen mask
7. Fowler's position
8. Heat

careful palpation of the cecum leads him to the conclusion that the greatest amount of attention should be paid not so much to the mode of treatment of the stump as to the correct pre-operative therapy proper selection of the anesthetic and gentle handling of the inflamed appendix.

The author favors invagination of the stump, followed by a purse-string suture provided that both steps can be performed rapidly with the help of a well trained assistant. JOSEPH K. NARA, M.D.

Stearns, E. J. Anorectal Actinomycosis. *Am J Surg* 940, 48 557

Actinomycosis of the rectum and anus is rare. There are only 17 reported cases, 6 of which are in the foreign literature. The author describes a case, reporting anorectal actinomycosis in a male aged seventy years.

Although the portal of entry of the infection is unknown it is suggested that contamination of any anorectal wound by cleansing with leaves or grass may offer direct contact for the actinomycetes. Four phases of the disease were described by Bensaude. The initial phase consists of proctitis which is accompanied by fever, abdominal cramps, and diarrhea or constipation. The second phase is one of woody infiltration. The third phase consists of the formation of abscesses and fistulas. The fourth phase is one of complications: (1) those which occur *in situ*, such as multiple deep fistulas, abscesses which result in the formation of cavities, and stenosis of the anus and rectum; (2) those which occur by continuity such as involvement of the pelvic viscera; and (3) those which occur at a distance, such as abscesses of the liver and septicemia.

Lesions in bone are uncommon, and may result from the secondary infection that accompanies the disease, rather than from direct invasion of bone by the fungus.

The diagnosis depends upon the demonstration of sulfur granules in the pus obtained from one of the abscesses, or in specimen of tissue examined microscopically. The author's patient had had several operations for fistula in ano before coming to the clinic, here sulfur granules were finally found in the exudate from one of the abscesses. Roentgenograms revealed an irregularity of the left margin of the lower sacrum which was interpreted to be due to actinomycosis.

There is no specific treatment, but the author recommends surgical drainage of the abscesses with minimal amount of manipulation sufficient doses of potassium iodide and satisfactory regimen of high voltage roentgen therapy. The author's patient received beginning doses of 5 gr (0.6 gm) of potassium iodide three times daily. Gauss packs saturated with Lugol solution are applied to the abscess of the rectum and fistulas. Deep roentgen therapy was administered. Desjardins advises the administration of from 400 to 500 roentgens generated at potential between 4 and 200 k and filtered through 6 mm. of aluminum or 75 mm. of

copper; the dosage depending upon the size of the patient.

Three years after the diagnosis was made, the patient is in good health, the sinuses are practically healed, and the bone lesion is apparently much improved. At present the patient is receiving between 60 and 80 gr (4 to 5.2 gm) of potassium iodide three times daily and the abscesses are washed with hydrogen peroxide, which procedure is followed by the insertion of packs saturated with Lugol's solution twice daily. The skin must be protected with vaseline while these packs are in place. As evidence that iodides are of definite therapeutic value, the author mentions that one time during the course of treatment, iodides had to be discontinued because of signs of iodism, during which time some previously healed sinuses reappeared, and the general condition became worse. Upon resumption of the treatment definite improvement was noted.

HAROLD LUTER, M.D.

Dukes, C. E. Cancer of the Rectum: An Analysis of 1,000 Cases. *J Pathol & Bacteriol* 940, 30 577

This is a comprehensive analysis of cases operated upon by excision for carcinoma of the rectum at St. Mark's Hospital, London. It was found that rectal cancer was twice as common in men as in women, and the average age of onset for women was considerably earlier than for men. The age at the time of surgical treatment in women was fifty-five and one-tenth years, and in men fifty-eight and six-tenths years.

The disease is more likely to spread more extensively in young patients than in the middle-aged or elderly. This was determined by recording the spread of cancer to regional lymph nodes. The incidence of lesions in the lower third of the rectum was 36.6 per cent, in the ampulla (middle third) 37.6 per cent, and in the upper third 30.8 per cent.

In the specimens examined, most cancers had the form of oval ulcers from 1 to 3 in. in diameter with their long axes in the horizontal plane. Multiple primary malignancies are present in 9 per cent of the excised rectums, but it is probable that if the whole colon could have been excised this figure could be higher. Therefore, some cases of alleged recurrence after excision of the rectum may be due to second unsuspected primary growth. Secondary tumors resulting from venous extension appear to be due to recirculation of the surface by growth within small veins of the submucosa. Multiple primary cancer is especially common in cases of polyposis intestinalis.

The tumors were classified according to the grade of malignancy (Broder), as well as to the degree of penetration into the wall (Dukes). Tumors of high grade malignancy are most frequent in young patients. There is a close relationship between the degree of malignancy as revealed histologically and the extent of lymphatic and venous spread.

In only 5 per cent of the cases was the growth restricted to the rectal wall (Group A) at the time

of excision. In about 35 per cent the growth had spread by direct continuity into the perirectal fat, but had not yet caused lymphatic metastases (Group B). Lymphatic metastases were found in about 50 per cent of the excised specimens (Group C).

Venous spread of rectal cancer is of great importance in view of the frequency of secondary growths in the liver. Evidence of the extension of rectal cancer within the lumen of hemorrhoidal veins was found in approximately 18 per cent of the operative specimens. Evidence of lymphatic permeation was encountered in about 15 per cent of all the cases, consisting mostly of growths of high grade malignancy.

HAROLD LAUFMAN, M D

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Twiss, J R, Carter, R F, and Hotz, R. The Determination of Biliary-Tract Infection with the Encapsulated Duodenal Tube. *Ann Int Med*, 1940, 13 2104

In this communication the authors have attempted to correlate the pre-operative and operative bacteriological findings in a series of 120 patients with chronic biliary-tract disease. In each case pre-operative duodenal drainage was performed under sterile precautions and the bacteriological findings of the duodenal bile were compared with the specimens obtained from the biliary tract at operation. The duodenal drainage was performed with a special tube which had previously been described by the authors. This tube attempts to avoid contamination from the stomach and upper intestinal passages by covering the bucket with a special capsule. This capsule dissolves in the duodenal chyme which uncovers the bucket through which the duodenal material is obtained. The encapsulated method gave a considerably higher incidence of sterile cultures and more cultures of organisms significant of biliary-tract infection than that found with the "open" method. Sterile cultures were obtained in all specimens of duodenal bile in 75 patients or 63 per cent of the series, and one or two types of organisms considered significant of biliary tract infection in 32 patients or 26 per cent. It was, therefore, apparent that findings considered satisfactory for diagnostic purposes were obtained in 89 per cent of the patients, whereas contaminations resulted in 11 per cent.

A comparative study of bacteriological cultures of duodenal bile and of the specimens obtained at operation showed that 74 of the 75 patients having sterile cultures of duodenal drainage also had sterile cultures of the biliary tract at operation. Of the 28 patients having positive cultures both in the duodenal bile and in the biliary tract, 25 had the same type of organisms in the biliary tract that had been cultured in the duodenal bile. Of the remaining 20 patients having positive cultures of the duodenal bile, 17 had negative results at operation and 3 showed organisms in the biliary tract different from those in the duodenal drainage bile. In only 1 pa-

tient a single sterile pre-operative specimen was not confirmed at operation, the biliary tract revealing the streptococcus. There was disagreement between the duodenal drainage and the operative findings in 21 cases or 17 per cent of the total series. The diagnostic accuracy of the duodenal drainage findings may, therefore, be considered to be 83 per cent. The authors state that by eliminating the 13 cases of disagreement obviously due to contaminations of duodenal bile, the diagnostic accuracy of the drainage is increased to 93 per cent. They hope that more experience with the encapsulated method will further reduce the incidence of contamination of the duodenal bile.

WILLIAM C BECK, M D

Mallet-Guy, P. Biliary-Intestinal Anastomoses. Late Results. Functional Results (Des anastomoses bilio-digestives résultats éloignés Résultats fonctionnels). *J de chir*, 1940, 55 303

French surgical opinion is generally in favor of biliary-intestinal anastomosis in which the gall bladder is used, whereas German opinion has been in favor of anastomosis in which the common duct is used. Laboratory experimentation has brought to light the following facts:

Anastomosis with the jejunum and colon leads to poor results. A continual intestinal reflux occurs in anastomosis with the gall bladder. Cholangitis is a common sequel. The duodenum and the stomach are about equally suitable for anastomosis. There is no relationship between the permeability of the bile duct and the subsequent patency of the bile duct. In the dog choledochoduodenostomies always result in infection and pancreatic reflux often causes liver necrosis. The dog's biliary tree is much more easily infected than man's. A method of preventing ascending infection is isolation of the part of the intestinal tube which is the site of the anastomosis. End-results of 43 anastomoses in which the gall bladder was used show 27 complete cures, 8 fair results, 3 cases of scar contracture of the stoma, 1 case which required a later gastro-enterostomy, 1 case of cholangitis, 1 case of late neoplasia of the mucosa of the stoma, and 2 deaths after six years. The author believes this operation is as satisfactory as any.

X-ray examination of 30 personal cases of cholecystogastrostomy with the aid of barium showed the patency of the stoma in 18 cases. In no case was air or barium seen to regurgitate into the main biliary tree. On the other hand, it has been reported that cholecystoduodenostomy allows such regurgitation in many cases (Guleke). The use of the Einhorn gastroduodenal tube helps to determine the patency of the stoma. Gastric acidity is not altered by the operation. The author believes the gall bladder is a barrier to infection between the intestine and the biliary passages.

The author's end results in cases of choledochoduodenostomy are as follows:

Anastomoses over prosthesis without direct suture produced 16 good, 3 fair, and 19 poor results. Terminolateral anastomoses after hepaticojunos-

tony produced 3 good and 1 fair result and fatal cholangitis, after hepaticogastrostomy 4 perfect and 4 mediocre results, and fatal cholangitis and after hepaticoduodenostomy 43 excellent, 13 fair and 42 poor results. Side-to-side choledochoduodenostomy produced 37 good, 4 fair and 17 poor results. These operative results are shown in 84 ray examinations of such cases. The presence of a kink in the biliary tree is common and the incidence of barium reflux is great.

Experiments made in conjunction with R. Kempf have shown that the pressure in the common duct after anastomosis to the duodenum is from one-half to one-third of normal. A meal will raise this pressure and prevent the entrance of the food into the biliary tree.

Therapeutic implications are to be drawn from this study. The stoma should be made from 1 to 2½ cm. wide to prevent stricture. If there is a chance of pyloric obstruction simultaneous gastroenterostomy or a gastrectomy of exclusion should be done to prevent reflux of food into the cholecystogastrostomy. It is only in pyloric obstruction that this occurs.

RICHARD WARRER, M.D.

Hayd, C. G. Factors of Mortality in 4,000 Operations upon the External Biliary System. *Ann Surg* 1940, 830.

An analysis of a group of 3,036 patients who were operated upon for gall-bladder disease as made to determine what the factors were that determined death. There were 309 deaths—mortality of 7.7 per cent.

When gall-bladder disease is complicated by involvement of the common duct the mortality is raised from 3.6 per cent to 34 per cent. The mortality risk inherent in surgery upon the common duct is more than three times greater than the risk of simple, uncomplicated cholecystectomy.

The operation of cholecystectomy represented only 1 per cent of the total operations for chronic gall-bladder disease. Among 3,036 operations for chronic cholecystitis, cholecystectomy was performed only 66 times, with a mortality of 33.3 per cent. Cholecystogastrostomy was performed 30 times, and choledochoduodenostomy times, with a mortality rate of 13.8 per cent. Thirty-six of the 5 anastomotic operations were for carcinoma and 6 for obstructive pancreatitis.

Choledochostomy for postoperative stenosis of the common bile duct or stones overlooked at operation was attended by a mortality rate of nearly 40 per cent.

Multiple surgery is one of the most outstanding factors in increasing the mortality rate. In 375 operations, cholecystectomy was combined with one or more other operative procedures, with an average mortality of 3.85 per cent which was nearly four times higher than that of cholecystectomy alone, namely 1.6 per cent. These "secondary" operations were inherently dangerous, and carried their own mortality rate if performed as

single operation for acute gangrenous appendicitis, gastroduodenal ulcerations, or fibrosarcoma of the uterus.

Jaundice, in any degree, was most impressive factor in the increased mortality in chronic cholecystitis. In 34 patients with jaundice at the time of operation, the mortality rate was 3 per cent. Eighty-six per cent of these patients had stones in the common bile duct.

Forty-six cases of perforation of the gall bladder occurred in so-called chronic cholecystitis, with a mortality of 9.5 per cent. Nine of the patients had perforations into the colon.

Cholecystectomy for chronic cholecystitis proved to be inadequate. Sixty-eight patients, after a cholecystectomy, were subsequently operated upon for recurrence of the symptoms, with a mortality of 7.4 per cent as contrasted with 3.61 per cent for primary non-complicated cholecystectomy.

There were 574 cases of acute cholecystitis, and the diagnosis of acute cholecystitis was made by the pathologist, after an examination of the gall bladder from 543 patients. In 30 cases no pathological examination as made as the patients had a cholecystectomy but they are classified as having acute cholecystitis. Cholecystectomy for acute cholecystitis was not an unmixed blessing as even when the patients recovered from the primary operation, subsequent surgery for the retained gall bladder gave a mortality of 30 per cent.

The mortality following operation for acute cholecystitis is shown in the table, the cases being subdivided according to pathological diagnosis.

TABLE I.—ACUTE CHOLECYSTITIS: PATHOLOGICAL ANALYSIS OF 574 OPERATIONS

(Summary)			
Pathological diagnosis	% of cases	Per cent of total	Mortality per cent
Acute cholecystitis	205	36	8.85
Purulent cholecystitis	7	10.4	8.40
Gangrenous cholecystitis	50	8.9	7.11
Perforated, with abscess	6	8	00
Perforated, with peritonitis	53	9	35.85
% pathological report	1	1.7	14.40
Total cases	374	100	10.97

The mortality in acute cholecystitis was remarkably influenced by pre-operative hospital treatment (Table II).

TABLE II.—THE MORTALITY AND MORBIDITY IN ACUTE CHOLECYSTITIS IN RELATION TO THE LENGTH OF PRE-OPERATIVE HOSPITALIZATION

Duration of illness and period	% of cases	Per cent per cent	Mortality per cent
0 to 6 hours	25	10	5.6
6 to 24 hours	297	1.6	7.4
24 to 48 hours	30	8	10.35
to 4 days	1	—	7.60
Totals	374	—	10.97

It may be assumed, therefore, that an immediate operation for acute cholecystitis, that is, an operation within six hours after admission, is seldom indicated. Adequate pre operative treatment from six to twenty-four hours is sufficient to insure the best results. Jaundice at the time of operation for acute cholecystitis increased the operative hazard, for 155 patients with acute cholecystitis complicated by jaundice were operated upon with a mortality of 20.6 per cent. In the patients who had acute cholecystitis but were not jaundiced at the time of their operation but had a history of previous attacks with jaundice, the mortality among 101 patients was 15.8 per cent, contrasted with the basic mortality of the cases of acute cholecystitis operated upon between six and twenty-four hours, namely, 7.41 per cent.

From this study, there emerge certain very definite conclusions. It is evident that chronic biliary disease is a continuous and progressive pathological condition and that the mortality and morbidity of this disease varies with the chronicity of the process itself, with the intrinsic pathological changes, with the complications, and with the physical status of the patient. Surgery for chronic biliary disease is sufficiently dangerous to be the only operative procedure which should be performed. The outstanding death producing conditions in order of frequency were as follows: (a) peritonitis, (b) pulmonary complications, and (c) varying states of hepatic insufficiency.

In regard to acute cholecystitis there is no warrant for what may be termed the "immediate" operation, that is, surgical intervention upon patients within six hours after admission to the hospital. The best results in acute cases, so far as mortality and morbidity are concerned, were obtained in the group of patients who were prepared for operation from not less than six hours up to twenty-four hours after their admission. Conservative treatment and watchful waiting, while they may appear temporarily successful, are eventually disastrous for the patient.

In the pathology of acute cholecystitis the mortality factor and the severity of the disease are increased when the patient has had previous attacks of icterus. Jaundice adds approximately 100 per cent to the mortality factor.

Cholecystostomy has a definitely higher immediate mortality than cholecystectomy, and has a more marked increase in the eventual mortality. Approximately 50 per cent of the patients with a cholecystostomy require re operation, which carries with it a secondary mortality close to 20 per cent. The most successful results were obtained in the group of 959 patients who were operated upon within two years after definitely demonstrable gall-bladder symptoms appeared. This low mortality, 1.35 per cent, was obtained in this series of cases regardless of the age of the patient, and is in contrast to the general cholecystectomy mortality of 3.61 per cent.

In the beginning of this series (1920) exploration of the common duct was carried out only in the presence of very marked disease of the common duct or associated pancreatitis. As the precision of operative technique became thoroughly established, more common ducts were explored, with better results and less mortality. The importance of disease of the common duct and of primary exploration is apparent from a consideration of the statistics. Drainage of the common duct for cholangitis or calculus at the first operation, and when combined with cholecystectomy, does not give a prohibitive mortality (11.34 per cent), whereas a secondary choledochostomy in a previously cholecystectomized patient has a mortality which is approximately 350 per cent greater than that which attends primary exploration (38.60 per cent).

SAMUEL H. KLEIN, M D

Benedetti-Valentini, F. *The Surgical Treatment of Acute Cholecystitis in the Typhoid Patient* (Circa il trattamento chirurgico della colecistite acuta nei malati di tifo). *Policlinico*, Rome, 1940, 47 sez chir 125.

The author refers to the severe type of acute cholecystitis occurring after the fever has subsided toward the end of an attack of typhoid. In this condition the entire wall of the gall bladder is involved, it may become gangrenous and perforate and the patient may die of septic peritonitis within forty-eight hours. For these patients the author favors cholecystostomy rather than cholecystectomy as the surgical procedure of choice. He reports 5 such cases, in 3 of which rupture occurred into the free peritoneal cavity. He notes the frequent occurrence of calculi in these cases and considers them responsible for the tendency to perforate.

The first case was that of a forty-year-old female who was admitted with an acute abdominal syndrome diagnosed as perforation of the gall bladder. Two months previously she had become severely ill with typhoid fever. After one month the fever returned with associated pain in the right hypochondrium. The condition was treated conservatively by capable internists, who at first discouraged surgical intervention. However, as the patient became worse, resort was made to surgery. An enlarged, thickened, greenish brown necrotic gall bladder was found with a large ulceration near its neck, and several large gall stones had fallen into the peritoneal cavity. The gall bladder was removed and a Mikulicz drain inserted. Nevertheless the patient died within forty-eight hours of generalized septic peritonitis.

In the author's series of 5 cases 3 patients died. The author favors cholecystostomy. Whenever immediate drainage is not urgent he advises, first, fixation of the fundus of the gall bladder to the abdominal wall, and, later, opening of the gall bladder for drainage in order that the abdominal cavity not be contaminated.

JACOB E. KLEIN, M D

Hofbauer J Laboratory Studies of 400 Gall-
Stone Operations (Laboratorien-L. ternschun-
gen bei 400 Gallenstein-Operationen) *Omnisgig*
930, no 28

The important characteristic factors of gall-stone disease which re permanently progressive with occasional regressive periods are infection, inflammation, and dysfunction. The object of bacteriological studies and experiments is to determine, if possible, the ultimate cause of gall-stone formation.

Four hundred gall bladders were surgically removed and infected calculi were found in 30.5 per cent and sterile calculi in 63.5 per cent. Twelve other gall bladders which did not contain stones were removed for a relative indication. Three hundred and seventy-three of the patients were women (93.5 per cent) and 7 were men (6.75 per cent). Colon bacilli were found in most of the cases. Typhoid bacilli were cultured from the gall bladders of women (3 per cent of the entire group of patients) and paratyphoid bacilli were cultured from women (0.5 per cent). The contents of the bladder were infected in 30 per cent of the patients who were younger than the average age of forty-two years, and in 43 per cent of those who were older. Histological examination revealed partial or complete necrosis of the gall-bladder wall in 4 cases. In the group of patients who were older than forty-two years there are 3 malignant tumors, tuberculous cholecystitis, and gangrenous cholecystitis. In a thirty-eight year old woman the cystic duct is occluded by a perianal fibroma, and in a fifty-year-old woman the fundus of the bladder contained a cystadenoma of hand-bout size. These were incidental findings.

The remaining 30 cases are of chronic cholecystitis of 3 different types: catarrhal, fibrous, and ulcerative. The catarrhal form was the mildest and 3 per cent of the sterile cases and 9 per cent of the infected cases were of this type. In fibrous inflammation there is a conspicuous thickening of the wall, particularly of the serosa. Seventy per cent of the 14 cases of this type are sterile. Ulcerative cholecystitis produced the greatest change. Half of these cases the gall bladder was sterile.

Under normal conditions the gall bladder is not simple receptacle but one which is provided with its muscular, all, gland, blood vessels, and lymphatic channels. Abnormal function of the gall bladder is partly dynamic and partly chemical. The former produces dyskinesia which may simulate the symptoms and signs of cholelithiasis. The latter is disturbance of secretion and resorption.

It was apparent from the material studied that most cases are operated upon as surgical climes because of secondary or tertiary changes. A simple, uncomplicated, calculous gall bladder is rarely. The exact period of gall-stone formation has not been well established. They re occasionally found during babyhood and even in the newborn.

The function of the gall bladder is determined by chemical analysis of its contents. The bilirubin content fluctuates to low and high values even in cases

with very small stones (Pölya). Consequently bile obtained by duodenal tube is subjected to chemical analysis.

Additional information regarding gall-bladder function is obtained by studies of the organ after it is filled with a opaque substance. Intravenous cholecystography was done in 304 of the 400 cases. The information obtained in this manner turned the interest to cholesterol. Most authors believe that cholesterol is a product of dysfunction. The author agrees with this viewpoint. According to Aschoff, Bachmeyer and Schüder gall stones are chiefly a result of inflammation, and not the converse. The author's studies favor the opposite conception. He believes that cholelithiasis is a progressive process which begins at certain age and passes through different stages such as normal gall bladder simple dysfunction, simple inflammation, simple calculous formation, inflammatory calculous formation, and destruction of the gall bladder. In addition, there are gangrenous, necrotic, calcified, and atrophied gall bladders the walls of which surround small tumors filled with stones and become adherent to adjacent structures and perforate into neighboring organs.

The question is: What is the factor which is consistently present with biliary complaints in the various stages? It is the author's opinion, from his studies, that this factor is dysfunction. Its association with cholesterol, metabolic changes, or consequent pathological deviations is not entirely clear and the same is true of its association with calculous formation.

The author summarizes as follows:

It is apparent from the study of 400 gall bladders with stones and without stones, which were removed for biliary complaints, that the cause of gall stone formation, which is established at an early period, should be sought in different combinations of the various forms of dysfunction. Infection and inflammation are secondary phenomena and other changes such as hemorrhage, necrosis, perforation, and calcification are tertiary products. When gall stone formation occurs in cases with congenital absence of the gall bladder or after its operative removal, it is due to dysfunction of the bile ducts which replace the function of the gall bladder. Intrahepatic stone formation, therefore, must be traced back to an abnormal function of the epithelium of the intrahepatic bile ducts.

(E. Liska) LEONARD W. GIBBS, M.D.

McGowan, J. M. and Henderson, F. F. The Prevention and Management of Pain Following Cholecystectomy. *New England J Med* 940, 943

Biliary colic following cholecystectomy is due to obstruction of the common duct which prevents the flow of bile into the duodenum. Obstruction of the common duct may be due to stone structure, edema, or spasm. The back pressure results in pain. Common-duct pressure of 70 mm. of water pro-

duces pain in some individuals, while 500 mm may be withstood by others with impunity. Prolonged T-tube drainage allows the common duct to resist greater pressures. Glyceryl trinitrate relieves duodenal spasm and tends to lower the resting intrabiliary pressure. The authors describe methods of studying the patency of the papilla of Vater and the condition of the bile ducts.

Biliary dyskinesia and many symptoms of cholecystitis are relieved by a course of treatment consisting of the daily use of glyceryl trinitrate to relax duodenal spasm.

SAMUEL H. KLEIN, M.D.

Allen, A. W., and Wallace, R. H. The Surgical Management of Stone in the Common Bile Duct. *Ann Surg*, 1940, 111: 838.

Comparative data are presented on groups of patients with biliary tract disease who have been subjected to common duct exploration, in an attempt to determine the effects of instrumentation of the papilla of Vater. The authors set out to ascertain the effects of gradual dilatation of the papilla, and to evaluate the dangers of immediate infection from reflux of the duodenal contents, of the precipitation of acute pancreatitis, and of the production of a false passage. They also attempted to determine the effect of the immediate hemorrhagic reaction, the temporary reactionary edema, and the late cicatricial contraction, as well as the effect of a permanently destroyed sphincteric action on the digestion, and the possibility that such an outlet is conducive to a future ascending cholangitis.

The comparative statistics on 1,228 patients operated upon for disease of the extrahepatic biliary system from 1930 to 1935, and 860 patients operated upon from 1935 to 1939, made it apparent that there is safety and rationale in routine, gentle, gradual dilatation of the duct outlet. Gradual dilatation carried out with malleable dilators in the manner suggested by the authors does not increase the mortality. In fact there were more infections, prolonged biliary drainage, and longer hospitalization in those patients who had no dilatation of their papilla.

The amount of dilatation, of course, varies greatly and depends upon the size of the duct and the size of the stones found in the gall bladder or in the ducts. The papilla alone should be dilated, and no attempt should be made to stretch the size of the duct itself. It has been found that most papillae can be dilated to about 7 mm.

Of 266 operations on the biliary tract, 59.7 per cent were duct explorations, and stones were found in 61.6 per cent of the ducts explored, or in 36.8 per cent of all cases operated on for biliary-tract disease.

Pulmonary complications were more frequent in those patients in whom dilators had been passed through the duct outlet, than in those who had had no instrumentation. This may be a coincidence, but one must accept the fact that the added time consumed may be of significance. Also, there were 4 deaths from bile peritonitis in the group of patients who had had dilatation and none in those who had

not been dilated. The authors suggest that the duct should never be sutured without adequate drainage to the outside. This should be accomplished by means of a tube sutured into the duct, as well as by drains placed in the dependent area of this region. There was 1 case of duodenal reflux which cleared up spontaneously in twenty-one days.

Late complications did not occur in this series. Apparently the sphincter is not destroyed when dilatation is carried to or just under the size of the average duct. Even when transduodenal exploration was necessary and the sphincter had been incised to remove a stone, there was no evidence of subsequent cholangitis or serious digestive disturbance. Late cicatricial contraction of the papilla following instrumentation did not occur. This was proved by secondary operations, performed for stones, in which some papillae permitted the same size dilators that had been passed at previous operations, and a few were instrumented with even greater ease than at the first operation. However, the authors doubt the permanence of the dilatation in the average case. In very large ducts with dilatation carried to 1 cm, the sphincteric action may be lost. Under these circumstances, it does not seem to have interfered with the health of the patient.

HAROLD LAUFMAN, M.D.

Morton, J. J., and Widger, S. The Diagnosis and Treatment of Acute Pancreatitis. *Ann Surg*, 1940, 111: 851.

Not only is the diagnosis of acute pancreatitis difficult and unsatisfactory by ordinary clinical methods, but accurate diagnosis of the different pathological types is rare. With this problem in mind, the authors decided to make use of some special test for pancreatic dysfunction. After reviewing the various tests advocated in the past ten years, it was decided that the amylase test was most constant and satisfactory for the measurement of pancreatic activity.

Somogyi's amylase method was therefore adopted. This test is easy to do and has been proved more accurate than any of the others. Normal values range between 70 and 200.

Of 12 cases showing significant elevations of the blood amylase, 9 came to operation. Seven showed evidence of pancreatitis, and in those with higher amylase levels the edema was marked. Of the 2 other cases, one presented an extensive carcinoma of the right upper quadrant, and the other a common-duct stone with marked edema over the common duct, and the pancreas normal to palpation.

In the severe, hemorrhagic, necrotic forms of pancreatitis, it is claimed that the blood-amylase test shows elevated values only for a transient period. The authors have had no experience with this type. It is suggested that when paracentesis is done, the amylase test on this fluid may be diagnostic.

As to treatment, drainage is advocated for pancreatic abscess. In the acute, fulminating, hemorrhagic, necrotic type, the pancreas should be disturbed as little as possible, drains being placed against its surface. The pancreas cannot be drained

by splitting the capsule as formerly advocated, because the organ is encircled by connective tissue partitions so that it is made up of many separate chambers.

Incision into the pancreas leads to hemorrhage and necrosis, which is damaging. The purpose of drainage is to establish sinuses and to wall off the general peritoneal cavity from the extension of the secretions. Necrotic tissue can be extruded along these same drainage tracts.

In the milder forms of acute pancreatitis, as represented by the edematous type, the amylase test is most useful in following the course of the disease. There is a tendency for this form to subside in most instances. After the subsidence of the attack, exploration of the common duct with drainage for some weeks is all that is found necessary to cure this condition.

Because elevated amylase readings are found in acute parotitis as well as in acute edematous pancreatitis, and because parotitis shows such remarkable response to small roentgen-ray treatments, it is suggested that these treatments might be of value in acute pancreatitis.

The authors' results seem to be satisfactory with 50 and 60 roentgen units measured through a portal in air until a total of from 350 to 450 roentgen units are given, and this mode of therapy is offered as a new means of shortening attacks of pancreatitis by putting the gland at rest.

HAROLD LATTMAN, M.D.

Beiling, C. A. Calcification of the Pancreas. *Am. J. Digest Dis.* 1910, 7, 31.

Approximately 30 cases of pancreatic lithiasis have been reported in the literature since the first description by De Graaf in 1664. Of these is exhibited disseminated calcification of the gland. The first example of this type of calcification was reported by Allen in 1903. A résumé of these cases and a detailed report of the author's case is given.

The author's case was that of a man who had had repeated attacks of acute pancreatitis, which preceded the deposition of calcium in the pancreas. Sharp, gnawing, low epigastric pain, radiating through to the back, accompanied each attack, and the intervals between attacks were symptom free. Important factors in the cause of the episodes of acute pancreatitis in this case were excessive indulgence in alcohol and repeated attacks of acute gastritis. X-ray examination revealed a penetrating duodenal ulcer in addition to the disseminated calcification of the pancreas. The latter was portrayed as a large number of milky calcific shadows.

The absence of diabetes mellitus in the presence of advanced parenchymal calcification of the pancreas corresponds to the findings in earlier cases of this condition, and indicates no widespread involvement of the islands of Langerhans.

The author calls attention to the difference between pancreatic lithiasis and disseminated parenchymal calcification of the pancreas.

SAMUEL H. KERRY, M.D.

GYNECOLOGY

UTERUS

Cusmano, L. Comparative Anatomical Studies on the Fine Vascularization of the Uterus (Ricerche anatomocomparative sulla fine vascolarizzazione dell' utero) *Ginecologia*, Torino, 1940, 6 251

Cusmano has studied the distribution of the blood vessels in the uterus of certain mammals (the cow, pig, goat, cat, dog, rat, and guinea pig) and presents a general view of the behavior of the vessels in this organ.

The collaterals of the uterine artery, after penetrating into the uterus, give rise to branches which follow the longitudinal axis of the organ; these branches are located between the external longitudinal muscular layer and the internal circular muscular layer. In the pig only are all the large vessels (arteries and veins) found in the mucosa. The arteries located between the two muscular layers emit external collaterals for the external muscular layer and internal collaterals for the internal muscular layer; these collaterals give rise to the capillaries which are distributed between the muscular fibers, the course of which they follow. This arrangement of the vessels is common to all cases with the exception of the pig in which, on account of the presence of the large arteries in the body of the mucosa, the external collaterals are distributed to the two muscular layers, while the internal collaterals go to the mucosa; the external collaterals passing through the circular muscular layer give rise to precapillaries and capillaries in this layer and pass on to the external muscular layer in which they divide into capillaries which run parallel to the longitudinal muscular fibers. The branches intended for the mucosa originate either (a) from the internal collaterals which, deriving directly from the large arteries, run through the internal muscular layer, in which they give rise to a capillary network, and penetrate into the mucosa, (b) or as in the cow, from a vascular plexus which is formed between the muscular layer and the mucosa by the internal collaterals and from which the arterioles for the mucosa detach themselves. Consequently, two capillary networks are developed in the mucosa, one in its deep portion and the other in its superficial portion.

In short, there are four capillary networks in the uterus, i.e., one for the external muscular layer, one for the internal muscular layer, and two for the mucosa. From these capillary networks are formed the small venous branches, all of which run to the large venous sinuses of the muscular layer and which represent therefore the first stage of the return circulation. In the majority of the cases examined by the author, these large sinuses are found together with the arteries between the external and the internal muscular layer and constitute what is

known as the vascular layer. In the pig only are the large venous sinuses together with the arteries found in the body of the mucosa, while in rodents the sinuses occur more easily between the internal muscular layer and the mucosa, being thus separated from the large arteries which are always located between the two muscular layers. However, this arrangement is not constant because venous sinuses are also found in the vascular layer. Therefore, it may be stated that in rodents it is possible to find the first stage of the return circulation either between the two muscular layers or between the muscular layer and the mucosa. The venous sinuses then communicate with the peruterine venous plexus from which the uterine veins originate.

RICHARD KEMEL, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

Stabler, F., and Thomson, J. G. Granulosa-Cell Tumor with Precocious Sexual Development in a Child Aged Six. *J. Obst. & Gynaec. Brit. Emp.*, 1940, 47 190

This case report deals with a girl of six, first examined in June, 1938. In November, 1937, the mother had recognized enlargement both of the breasts and of the abdomen; shortly afterward it was discovered that the nymphæ were unusually well developed. Vaginal bleeding started about this time, it was free and continued for three weeks. Further vaginal bleeding occurred in February 1938, again in April, and bleeding had been present for eleven days when she was admitted to the hospital on June 13.

The pertinent physical findings included breast development corresponding to an age past puberty, fine dark, sparsely distributed pubic and axillary hair, up to $\frac{1}{2}$ in. in length, and the external genitalia were developed as in an adolescent. The abdomen was protuberant because of a firm, smooth, rounded tumor rising out of the pelvis and extending just above the navel. X-ray films showed normal epiphyses.

On June 18 an endometrial biopsy was taken and the endometrium was found to be hypertrophied. The pelvic mass was a tumor of the left ovary, it was removed. The opposite ovary apparently was infantile.

The tumor weighed 715 gm., it was solid and there were no areas of hemorrhage, degeneration, or necrosis in it. Microscopically it was formed of solid columns of cells of an epithelial type which were separated by fine connective tissue. The cytoplasm of the tumor cells was finely vacuolated, the tumors contained innumerable tiny droplets of fat. The endometrium consisted of slightly dilated glands lined by tall columnar cells, the stroma cells were round or oval and were packed together rather closely.

The effects of the operation were striking. Uterine bleeding stopped after six days and has not recurred during the ensuing year. The breasts showed definite regressive changes after two months and continued to regress for six months. The pubic and axillary hair was replaced by fine hair down that is hardly perceptible. The enlargement of the clitoris and labia became much less marked but the nymphae remain larger and more protruding than usual. The abolition of the external genitalia and the breasts appeared to cease about six months after removal of the tumor.

Before operation there are approximately international units of estrin in 40 c.c.m. of blood. Two months later there was less than 1 unit. Before operation there were 5 international units of combined estrin and 4 international units of free estrin per liter of urine. Two weeks after operation there was less than 1 unit of combined estrin per liter of urine and 6 months later none was demonstrable.

The authors comment on the difficulties encountered in deciding from clinical and anatomical observations alone whether tumors are producing fetal hormone or estrin. Hormonal studies must be the deciding factors. A high lipid content of tumor cells does not necessarily indicate that they produce progesterin.

GEORGE H. GARDNER, M.D.

MISCELLANEOUS

Averett, L. The Advantages of Vaginal Approach to Pelvic Pathology. *Am J Obs & Gynec.*, 1919, 39: 776.

This study is based on an experience with 1,060 patients operated upon by the vaginal approach.

Vaginal section was found to be superior to abdominal section in that it carried lower mortality and morbidity rate. There were 3 deaths in the series, mortality rate of 0.3 per cent. The character and extent of the pathology were on par with those which may be seen in any similar number of patients operated upon in any exclusively abdominal clinic.

The author used spinal anesthesia almost exclusively with both safety and satisfaction, in all abdominal and pelvic surgery. Most of the operations are done under spinal anesthesia without an anesthetic death, or any morbidity traceable to the anesthetic.

There are separate indications for operation which were met by 1,060 primary and 1,153 additional operations, or total of 2,213 operative procedures.

In the cases of 4 ectopic pregnancies, operation was successfully performed through the vaginal route. Non-neoplastic uterine bleeding of long, or close to the time of the menopause, the indication for operation in 20 patients. Vaginal hysterectomies were done in all of these, with or without the preservation of the ovaries, the age of the patient and the ovarian activity being the deciding factors.

In the discussion, NICKOLSON said that the conservatism from abdominal hysterectomy is a good thing, but is so simple that it is inconceivable why anyone should attempt to perform this operation by any route except that of the abdomen. He stated there was no question that in rare cases vaginal hysterectomy has its place but that the vaginal approach to pelvic inflammatory disease, ovarian cysts, or ectopic pregnancy is entirely unjustifiable.

EDWARD L. COE, III, M.D.

Pierre, L. M. and Erlande, G. Gynecological Significance of the Male Hormone (La place de l'hormone mâle en gynécologie). *Rev. franç. de gynéc. et obst.* 1940, 35: 97.

In 1934 Pierre and Jouve presented a monograph on the heterologous hormonal effect of a protein extract of the male sex gland. This extract, since known as androtestin, demonstrated as having both a inhibitory and stimulating effect upon the ovarian function. Its regulatory effect in functional genital disorders and in particular in sexual disorders. This regulatory effect is still being successfully used after fifteen years.

The testicular hormone, testosterone, has an entirely different action. It has been shown to exert an inhibitory effect upon the female sex hormones. An attempt has been made to compare this effect with that of the well known inhibiting hormones, such as corpus luteum and mammary gland hormones and hormones from the posterior lobe of the hypophysis.

After briefly reviewing the results of animal experiments with testosterone, the writers report their own results with testosterone propionate in four types of cases. These included ovulation crises, premenstrual mammary congestion and tenderness and chronic mastitis, all having in common functional hyperactivity of the ovaries.

In a number of patients presenting congestion characteristic of the period of ovulation, testosterone propionate as administered in 3 or 4 doses of 100 mgm. each, by injection on the days preceding the attack, soon this could be foretold, usually between the ninth and thirteenth days of the cycle. If the date of attack could not be foretold, or 30 mgm. of the testosterone propionate are injected at the onset of pain or first signs of hemorrhage. In all cases treated, with negative results in 8, doubtful results in 1 and satisfactory results in only 2 cases. As these results could not be regarded as encouraging, the method was discontinued.

It has been suggested that an excess of follicular may induce mammary reactions leading to adenoma or even to adenocarcinoma. Inhibitory treatment is therefore indicated. The authors agree with Desmarest regarding the indications for the use of this hormone, not only in simple premenstrual congestion without anatomical basis, but also in glandular nodules or more or less extensive cysts (Reclus disease) however they use a slightly different technique. In the first place they use testosterone

propionate, not acetate, in doses of 10 mgm per injection. Injections are commenced between the eleventh and fifteenth days of the cycle and repeated every two days, 5 or 6 injections being given, in accord with the duration of the cycle in the individual case. The treatment is always discontinued at least five days before the expected period in order to avoid the risk of interruption of the cycle. In all, 14 cases were treated. Of these, 9 presented simple premenstrual congestion of varying degree. Persistent chronic mastitis was present in 4 cases with premenstrual swelling. The treatment proved a failure in 3 cases, in 2 of which the obesity of the patient may have been a factor. All the other patients benefited by the treatment and often very rapidly. Constant observation is necessary in these cases in order to establish new therapy based on the changes obtained.

In fibroma of the uterus the authors made use of testosterone acetate. The doses varied from 40 mgm (4 injections of 10 mgm) to 200 mgm (5 injections of 40 mgm). As in the mastopathies, the injections were administered between the eleventh and twentieth days of the cycle, and, as a rule, every other day. Of the 11 cases treated, 2 presented multiple subperitoneal fibroma, 4 intramural fibroma, and 5 submucosal fibroma, 2 produced abundant and continuous menorrhagia. The results of treatment in the 7 cases presenting menorrhagia were very satisfactory and often very prompt. Frequently the quantity and duration of the menses were diminished after the first series of injections. The hemostatic properties of testosterone appear unquestionable.

The question is brought up, however, as to whether the new hormone may check the development of fibroma or cause its regression once the tumor is present. Desmarest is of the opinion that it may. The experience of the present writers is too recent to permit of conclusions. In 3 cases they had the impression that the tumor had diminished in size. In 8 other cases they believed that the hormone had inhibited the development of the tumors, which remained stationary after treatment. It is emphasized that the growth of fibroma is most irregular and capricious.

It is concluded that testosterone propionate is the treatment of choice for all mastopathies except malignancy. For the present, testosterone acetate must likewise be regarded as the treatment par excellence for fibroma, particularly in women under forty years of age, and for fibroma of small and medium size.

EDITH SCHANCHE MOORE

Abarbanel, A. R. The Percutaneous Administration of Testosterone Propionate for Dysmenorrhea. *Endocrinology*, 1940, 26, 765.

The percutaneous administration of testosterone propionate has been shown to relieve dysmenorrhea and premenstrual tension. It involves at least two cardinal considerations. These are the nature of the vehicle and the concentration of hormone per unit

volume. Sesame oil proved to be a more efficient vehicle than the ointment base used. Provided the total dosage remains the same, the greater the concentration of hormone per unit volume, up to a certain maximum, the greater the effective absorption.

The indications for percutaneous administration of testosterone propionate for dysmenorrhea with or without premenstrual tension are objection to parenteral therapy, maintenance therapy for residual symptoms after parenteral administration, and when parenteral therapy is unavailable. Each patient should be strongly urged to receive injections first in order to determine the response to testosterone propionate, the amount necessary for percutaneous administration may thus be gauged.

Dose for dose, the subcutaneous route is the most efficient method of administration. The intramuscular route is from one-half to two-thirds as effective. Testosterone propionate is from one-third to one-sixth as effective when given percutaneously as when given by the subcutaneous route. Orally, combined with bile salts, it is about one-seventh as effective as when given subcutaneously. From a practical viewpoint, however, the percutaneous method is much more economical than parenteral therapy and so is preferable to the patient.

No signs of masculinization were ever noted. The only possible sign of defeminization was the loss of nymphomaniac tendencies in one patient.

J. THORNWELL WITHERSPOON, M.D.

Hunter, G. W. Transverse Abdominal Incisions in Pelvic Surgery. *Am J Obst & Gynec*, 1940, 39, 593.

Transverse abdominal incisions for pelvic pathology are not widely used in this country. These incisions are the safest and most logical approach to pelvic pathology when laparotomy is required.

Seven hundred cases of transverse incision are reported without 1 instance of postoperative hernia or evisceration.

The following advantages are stressed.

A Almost complete absence of postoperative hernia and evisceration. Careful review of the literature reveals that these complications are essentially those of unphysiological incisions, that is, incisions other than transverse.

B Better scar. Incisions should be made along Langer's lines of skin cleavage.

C Adequate exposure. The Pfannenstiel incision can be used in a preponderant number of cases and when one is familiar with this incision, he can usually get adequate exposure. The Maylard or Bardenheuer incision will give adequate exposure for any pelvic operation.

D Better blood supply to the wound with consequent better wound healing and lower incidence of wound infection.

E Less tendency toward adhesions. Some factor other than imperfect closure is responsible for the high incidence of adhesions following the longitudinal incision.

The effects of the operation were striking. Uterine bleeding stopped after six days and has not recurred during the ensuing year. The breasts showed definite regression changes after two months and continued to regress for six months. The pubic and axillary hair was replaced by fine hair down that is hardly perceptible. The enlargement of the clitoris and labia became much less marked but the vulva remained larger and more protruding than usual. The involution of the external genitalia and the breasts appeared to cease about six months after removal of the tumor.

Before operation there were approximately 3 international units of estrin in 4 c.cm. of blood. 6 months later there was less than 1 unit. Before operation there were 3 international units of combined estrin and 4 international units of free estrin per liter of urine 6 weeks after operation there was less than 1 unit of combined estrin per liter of urine, and two months later none was demonstrable.

The authors comment on the difficulties encountered in deciding from clinical and anatomical observations alone whether tumors are producing luteal hormone or estrin. Hormonal studies must be the deciding factors. A high lipid content of tumor cells does not necessarily indicate that they produce progesterone. **GEORGE H. GARDNER, M.D.**

MISCELLANEOUS

Averett, L. The Advantages of Vaginal Approach to Pelvic Pathology. *Am J Obst. & Gynec.* 94, 39-776.

This study is based on an experience with 1,000 patients operated upon by the vaginal approach. Vaginal section was found to be superior to abdominal section in that it carried lower mortality and morbidity rate. There were 3 deaths in the series, mortality rate of 0.3 per cent. The character and extent of the pathology were on par with those which may be seen in any similar number of patients operated upon in any exclusively abdominal clinic.

The author used spinal anesthesia almost exclusively in both safety and satisfaction, for all abdominal and pelvic surgery. Most of the operations were done under spinal anesthesia without an anesthetic death or any morbidity traceable to the anesthetic.

There were separate indications for operation which are met by 600 primary and 350 additional operations, or total of 950 operative procedures.

In the cases of 24 ectopic pregnancies, operation was successfully performed through the vaginal route. Non-neoplastic uterine bleeding during or close to the time of the menopause was the indication for operation in 70 patients. Vaginal hysterectomies were done in all of these with or without the preservation of the ovaries, the age of the patient and the ovarian activity being the deciding factors.

In the discussion, NICHOLSON said that the conservatism from abdominal hysterectomy in good hands is so simple that it is inconceivable why anyone should attempt to perform this operation by any route except that of the abdomen. He stated there was no question that in rare cases vaginal hysterectomy has its place, but that the vaginal approach to pelvic inflammatory disease, ovarian cysts, or ectopic pregnancy is entirely unjustifiable.

EDNA AND L. CONNELL, M.D.

Pierre, L. M. and Erlande, G.: Gynecological Significance of the Male Hormone (La place de l'hormone mâle en gynécologie). *Rev. franç. de Gynéc. et Obst.* 94, 35-97.

In 1921 Pierre and Jouve presented a monograph on the heterologous hormonal effect of a protein extract of the male sex gland. This extract, since known as "androstine" was demonstrated as having both an inhibitory and a stimulating effect upon the ovarian function, its regulatory effect in functional genital disorders and in particular in sexual disorders. This regulatory effect is still being successfully used after fifteen years.

The testicular hormone testosterone, has entirely different action. It has been shown to exert an inhibitory effect upon the female sex hormones. An attempt has been made to compare this effect with that of other well known inhibiting hormones, such as corpus luteum and mammary-gland hormones and hormones from the posterior lobe of the hypophysis.

After briefly reviewing the results of animal experimentation with testosterone the writers report their own results with testosterone propionate in four types of cases. These included ovulation crises, premenstrual mammary congestion, and terine and chronic mastitis, all having common functional hyperactivity of the ovaries.

In a number of patients presenting congestion characteristic of the period of ovulation, testosterone propionate, administered in 3 or 4 doses of mgm. each, by injection on the days preceding the attack, when this could be foretold, usually between the ninth and thirteenth day of the cycle. If the date of attack could not be foretold, or 30 mgm. of the testosterone propionate were injected at the onset of pain or first signs of hemorrhage. In all cases were treated, with negative results. In doubtful results in and satisfactory results in only 2 cases. As these results could not be regarded as encouraging, the method was discontinued.

It has been suggested that an excess of follicular may induce mammary reactions leading to adenoma or even to adenocarcinoma. Inhibitory treatment is therefore indicated. The authors agree with Desmarest regarding the indications for the use of this hormone, not only in simple premenstrual congestion without anatomical basis, but also in glandular adenomas or more or less extensive cysts (Reclus disease) however they use a slightly different technique. In the first place they use testosterone

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Mitra S. Simultaneous Intra-Uterine and Extra-Uterine Pregnancy. *J Obst & Gynaec Brit Emp*, 1940, 47, 206

Mitra adds 2 cases of simultaneous intra uterine and extra uterine pregnancy to the world's literature to bring the total up to 306. The importance of this complication lies in the fact that sometimes one condition is overshadowed by the other, and the true diagnosis is made only at operation.

Simultaneous pregnancies are sometimes termed combined or compound pregnancies. It may be a type of twin pregnancy, one fertilized ovum reaching the uterus and the other staying in the fallopian tube. The uterine pregnancy may take its origin at the same time, the intra uterine pregnancy may antedate the extra uterine, or vice versa. A woman may also conceive in the uterus while carrying the products of an extra uterine gestation.

In the author's first case a vaginal examination revealed a pelvic hematocoele. At operation, in addition to the hematocoele, the uterus was found enlarged and so densely adherent to the mass that it was thought best to remove it with the ectopic sac. Microscopic examination showed chorionic villi in the blood clot through the tubal rent and an intra uterine fetus of about eight weeks' duration.

In the second case, operation revealed a ruptured ectopic gestation in the right fallopian tube. The uterus was found to be enlarged to about a three months' pregnancy. A diagnosis of intra uterine pregnancy not being absolutely certain, the uterus was removed along with the ruptured sac. During its removal the uterus was found to be gravid.

The management of a combined pregnancy is entirely surgical.

CHARLES BARON, M.D.

Amabile, G. Enlargement of the Left Breast and of the Left Lobe of the Thyroid Gland Recurring During 4 Successive Pregnancies (Ingrossamento della mammella sinistra e del lobo sinistro della tiroide ripetutosi in 4 successive gravidanze). *Clin ostet*, 1940, 42, 157.

Amabile discusses the case of a woman, aged thirty-four years, who developed an enlargement of the left lobe of the thyroid gland immediately after her first delivery and, in addition, a great enlargement of the left breast during each of her 4 subsequent pregnancies. He has kept his patient under constant observation for fifteen months. As he was not allowed to take a biopsy of the breast to determine the exact anatomicopathological nature of the disorder, he had to limit himself to testing the reactions of the breast to functional stimulation or inhibition with various substances.

1. Injections of follicular hormone (only solutions of 50,000 international units of progynon B, each)

caused a marked enlargement of the swelling of the breast, the increase was 2 cm. in the vertical and $3\frac{1}{2}$ cm. in the horizontal direction.

2. Injections of corpus luteum hormone (only solutions of 5 mgm. of proluton Schering, each) produced no change in the size of the breast.

3. Injections of Ilihyran Bayer caused a decrease of $1\frac{1}{2}$ cm. in the size of the breast, both in the vertical and the horizontal directions.

4. Injections of testosterone propionate (testovirone Schering, 20 injections of 5 mgm. each) caused a marked decrease of the entire swelling, the decrease was 2 cm. in the vertical and 4 cm. in the horizontal direction.

5. The injection of 0.01 gm. of pilocarpine hydrochloride gave a result that may be regarded as practically negative, as the perspiration appeared on the right part of the chest, and especially in the axilla about one minute before it appeared gradually on the left side. On admission the patient stated that the swelling disappeared completely nine months after delivery; subsequent observation showed that this impression was erroneous.

The author feels justified in drawing the following conclusions from his experimental data.

1. The patient is suffering from a process of chronic mastitis which produces a chronic local stimulation.

2. She has an asymmetry of the tonus of the sympathetic innervation of the two sides and, therefore, an asymmetry of the trophism, whether connected with or independent of the unilaterality of the thyroid lesion.

3. The hyperfolliculinemia, which is so characteristic of pregnancy, represents the ultimate factor which caused the hypertrophy of the breast, the localization on the left side having been decided by the two factors mentioned previously.

4. The decrease of the swelling within a limited time (about forty five days), obtained by means of injections of testovirone Schering, allows the statement that this promising result can be explained by the inhibiting action of testicular preparations on the breast, this action was noted long ago on the basis of hypertrophy of the breast observed in a case of lack of development of the testicles and after interventions which compromise the function of the testicles.

RICHARD KLMEL, M.D.

Liston, W. G., and Cruickshank, L. G. Leucorrhoea in Pregnancy. A Study of 200 Cases. *J Obst & Gynaec Brit Emp*, 1940, 47, 109.

At the laboratory of the Royal College of Physicians, Edinburgh, among 200 pregnant women who were supposed to be suffering from leucorrhoea, 40, or 20 per cent, showed normal vaginal contents characterized by the findings that pus cells were less numerous than epithelial cells, that the bacterial

tension, which may become permanent in the form of an essential hypertension. The characteristic finding in this condition is an elevated blood pressure without any signs or symptoms indicative of renal involvement.

In the benign form of hypertensive disease, the blood pressure is usually not elevated to extreme degrees, no albuminuria exists, ophthalmological examination reveals only minimal changes in the vessels, and symptoms are commonly absent. In the severe forms, or malignant type, the retinal vessels show more marked involvement, and, finally, kidney function becomes impaired. Thus it is clear that from the benign form there is a transition to the malignant type, in which the condition sooner or later shows renal involvement.

In Stander's clinic this new classification has been employed since April 1, 1939 (Table I) and has

TABLE I—INCIDENCE OF TOXEMIA—
NEW CLASSIFICATION

108 Cases in 1,503 Pregnancies

From April 1, 1939 to September 30, 1939

Type of toxemia	No of cases	Percent age of total
Vomiting of pregnancy	7	6.5
Acute yellow atrophy of liver	1	0.9
Eclampsia	4	3.7
Severe pre eclampsia	7	6.5
Mild pre-eclampsia	51	47.2
Hypertensive disease	31	28.7
Renal disease	7	6.5
Total	108	100.00

proved simple and workable. The incidence of toxemia was about 7 per cent. Toxemia has accounted for 7.1 per cent (4 deaths) of the total maternal mortality in 30,457 patients (1932-1939).

DANIEL G. MORTON, M.D.

Caffaratto, T. M. A Rare Case of Massive Expulsion of Decidua after Abortion at the Fifth Month (Un raro caso di espulsione massiva di decidua dopo aborto al V mese). *Ginecologia*, Torino, 1940, 6: 229.

A primigravida of twenty-six years in the fifth month of gestation was admitted complaining of labor pains. In spite of sedation, the pains increased in severity and frequency, and after a few hours she expelled a dead fetus weighing 600 gm. This was followed in a few minutes by the placenta which weighed 170 gm. Ten minutes later a pale red membrane was expelled, measuring 9 by 14 cm and from 4 to 10 mm in thickness. One side of this membrane was quite smooth, but the other presented numerous villi. On histological examination, it proved to be decidua in which there were two distinct zones, one characterized by interstitial infiltration by leucocytes and small cells, and the other showing signs of early necrosis with either dark nuclei or complete absence of them. The placenta was of the marginate type and also showed some leucocytic infiltration. FRANK McDOWELL, M.D.

LABOR AND ITS COMPLICATIONS

Ince, J. H., and Young, M. The Bony Pelvis and Its Influence on Labor, A Radiological and Clinical Study of 500 Women. *J. Obst. & Gynaec. Brit. Emp.*, 1940, 47: 130.

The authors recorded the results of a detailed study of the architecture of the pelvis as revealed by roentgenography in a consecutive series of fully 500 women in the early stages of pregnancy who were attending the antenatal clinic of the University College Hospital, University College, London. They attempted, by correlation of the variations in the pelvic size and shape with subsequent obstetrical histories, to determine to what extent, if any, these variations influenced the presentation and position of the child and the mechanism of labor.

The average measurements of the true conjugate and greatest transverse diameters of the pelvic inlet in this series of London women were of much the same order, and the same variations were seen as in the corresponding diameters in Nicholson's series of women from rural Gloucestershire.

The estimates given in current textbooks of anatomy and obstetrics for the true conjugate diameter of the normal female pelvis are too small to be considered representative of the modern English woman and require revision.

The average pelvic brim index in English women is not platypellic (relatively flat index under 90 per cent), as has been maintained since the time of Turner, but falls into the intermediate or mesatipellic class, i.e., it shows an index of over 90 per cent.

The attempt to classify the shape of the pelvic brim merely by subjective impressions into 10 or 12 classes as suggested by Caldwell and Moloy is not only unscientific but results in a classification which is cumbersome and of no practical value.

Both the anteroposterior and transverse diameters, and consequently the estimated area, of the pelvic outlet in this series of women were definitely smaller than in the women from rural Gloucestershire, but the difference may be explained in part by a difference in the technique of measurement.

The intensity of the relation found between the various pairs of characters of the female pelvis is usually of a low order and presumably of little practical importance. The correlation coefficient, however, between the approximate areas of the pelvic inlet and outlet is as high as 0.5.

As the greatest transverse diameter at the pelvic inlet is fairly highly correlated with the intercristal diameter, and as the latter can be measured in the living subject by calipers with a high degree of accuracy, the average transverse diameter that would be found associated with a specified intercristal diameter may be predicted fairly satisfactorily, although the predicted value may diverge considerably from the actual diameter in particular cases. The external conjugate in the living can be measured much less accurately by calipers, and is definitely

less reliable for the prediction of the corresponding true conjugate diameter.

There is little, if any evidence in this series of women of any relation between pelvic characters, including the shape of the inlet and physical characters expressive of the type of body build.

There was no conclusive evidence in the data that male distribution of the pubic hair and iliacities has any association with the presence of male tendencies in the female pelvis.

Of the pelvic characters brought under review the only two which seemed to have an influence in determining whether assistance in delivery by the forceps would be necessary or not were the size of the pelvic outlet and the size of the subpubic angle. In this series it was at the pelvic outlet that most of the difficulties arose.

Another factor of importance in determining whether delivery would occur spontaneously or not is the size of the child's head. Its influence is clearly shown in this series of women.

There was also evidence of tendency of persistent occipitoposterior positions to occur in pelvis which were relatively long in the occipitoposterior direction, i.e. the anthropoid type, although the shape of the pelvis could not be considered wholly accountable for this form of malposition.

As there was no evidence that minor variations in the shape of the pelvic brim had an influence on the course of labor, whereas there did seem to be relation between the actual size of the pelvis and the possibility of natural delivery as much attention should be directed to the estimation of the pelvic width as to the measurement of the true conjugate diameter. Thus, there seem to be valid reasons for preserving the accepted classification into flat and generally contracted pelvis rather than adopting the suggested types of Caldwell and Mowbray which rely too much on impressions of the shape of the pelvic inlet.

CHARLES BAXTER, M.D.

Smith, E. F. Transcervical Cesarean Section with Peritoneal Excision and Bladder Mobilization. *Am. J. Obst. & Gynec.* 1940, 39: 793.

Through Pfannenstiel incision the abdomen is entered by transverse incision in the parietal peritoneum, following which the peritoneum over the lower uterine segment is cut transversely loosened, and secondly the parietal peritoneum, which creates an extra abdominal approach to the lower uterine segment. A transverse incision is then made in the lower uterine segment, through which the baby is delivered.

The author reports he has performed this operation 7 times, and that the mothers and babies are all alive. There are no serious postoperative complications. One patient remained in the hospital twenty-seven days because of mild pulmonary complications, but the others were there only from ten to sixteen days. Postoperative discomfort is absent in all cases, including in such the patients had moderate distention. Seven patients were

frankly infected. One had had numerous preoperative vaginal examinations, with attempts at forceps delivery yet she recovered uneventfully. In another patient the uterine artery was cut and sutured with no untoward sequelae.

The technique affords a more roomy elastic area than any of the other excision operations and precludes the formation of postoperative adhesion bands. It eliminates the possibility of subsequent intra-abdominal hernia, minimizes trauma to the bladder and preserves the nutrition of the peritoneum. It localizes the operative site so that the uterus and bladder are not jeopardized, and restricts the operation to the well oriented lower peritoneal cavity yet provides complete peritoneal exclusion. It is equally useful in infected and non infected cases, and is not contraindicated by breech presentation, placenta previa, and other intra-uterine complications.

EDWARD L. CORNWELL, M.D.

PUERPERIUM AND ITS COMPLICATIONS

Cicchella, T. Urinary Colibacilliosis and Enterovaginal Syndromes During the Puerperal Stage (Colibacilliosis uteraria, endocervical enterovaginalis acuta puerperalis). *Arch. Gynec. Obstet.* 1940, 4: 6.

Cicchella presents an extensive discussion of the literature on the etiopathogenesis, the symptomatology and the treatment of colibacilliosis in the various phases of the puerperal state and offers his observations on 60 personal cases of enterovaginal syndromes and of pyelonephritis caused by the bacillus coli during pregnancy. The frequency of these cases amounted to 5.80 per cent of the admissions to the Obstetrical Clinic of Torre del Greco from January 1933, to June, 1939. However acute febrile cases are rare as the ratio of evident to latent forms is 1 to 7. The greatest frequency of occurrence was found between the ages of twenty and thirty years, with the maximum between twenty-seven and twenty-eight years, during the second and third pregnancies, but even the fifth and the seventh months of pregnancy and during the late fall and the winter months. The acute febrile forms are observed especially during the puerperium and represented probably the acute episode of the subfebrile or latent forms present during pregnancy.

The clinical signs obtained by questioning the patients were in order of frequency: chills, pollakiuria (especially nocturnal) perspiration, abdominal-pelvic pain, gastro-intestinal disturbances, asthenia, and toxic manifestations of pregnancy. Chills, pollakiuria, and spontaneous abdominal pain were most frequently associated with and seem to be characteristic of the urinary localization of the colibacilliosis during pregnancy especially in the latent forms. Direct examination gave the following order of frequency for the points in which pain is elicited: the pelvic ureteral point of Barry, the costumuscular point of Cava, the para-umbilical point, and the urethral point. By far the most frequent findings in the urinary sediment are leucocytes

with some red cells and epithelial cells, bacilluria was not often observed, but in several cases there were numerous crystals of calcium oxalate. Culture of the urine was positive in 47.7 per cent of the cases, however, the cytological findings in the urinary sediment should be accepted as sufficient support for the positive symptomatological picture, and the negative results of the culture should not lead to neglect of treatment. Persistence of bacilluria or of positive cultural results has been noted in several cases that were clinically cured by the treatment, this excludes the concept of bacteriological cure and shows the possibility of recurrence of the condition.

The treatment consists essentially of urinary disinfection. In cases with marked manifestations, such as putrid fermentation or diarrhea, complementary vaccine treatment by mouth with lysates of bacillus coli was also used with good results. As urinary disinfectants, the author employed at first urotropine preparations and later the derivatives of mandelic acid as they became available in Italy. He has had no occasion to use sulfanilamide preparations. In some mild cases, he has administered orally 2 or 3 times a day 40 cgm. of urotropine associated with 15 cgm. each of camphoric acid and sodium benzoate. However, in most cases he has given commercial preparations of urotropine intravenously and has obtained good results, the acute febrile cases of the puerperium responded even better and more rapidly than the chronic or febrile cases, the fever disappearing after the first or at most the third or fourth injection. The only disadvantage is the possibility of renal congestion, which can be overcome by suspension of the injections and the administration of an alkalinizing and diuretic treatment for a few days. However, in general the kidneys stand the treatment well.

The author has also employed ammonium mandelate. It acts well in subacute and chronic forms. Associated with sodium acid phosphate, it acts well in cases with predominance of nervous and toxic symptoms and in oxalemic syndromes. It is less

efficient in acute febrile cases. Gastric intolerance is rare. Unfortunately, the special diet on which mandelic therapy is based cannot be used in pregnancy, and this may impair the benefit to be derived from the treatment. As a rule, the colibacillary manifestations reappear on suspension of the treatment, each cycle of which should not exceed from ten to fifteen days. Urine cultures remain positive even after protracted treatment which has resulted in clinical cure. Ammonium mandelate has no injurious action on the renal function which, however, should be intact before the treatment is instituted. Supplementary acidification with ammonium chloride was unnecessary because most of the cases already had an acid urine.

RICHARD KEMEL, M.D.

NEWBORN

DeCosta, E. J. Spontaneous Pneumothorax of the Newborn Infant. *Am. J. Obst. & Gynec.*, 1940, 39, 578.

The literature on the subject of pneumothorax of the newborn infant is reviewed, 67 cases have been collected and studied. Of these, only 46 have been directly associated with birth. Two additional instances at the time of birth are reported, one unique in that subcutaneous emphysema and pneumoperitoneum were also present. There appear to be two clinical types of pneumothorax in the newborn infant, one arising suddenly, pneumothorax abrupta, demanding prompt treatment, the other more gradual and less severe, pneumothorax lenta, with good prognosis irrespective of treatment. Resistance to the flow of air through the tracheal catheter during insufflation is suggestive of pneumothorax. The danger of producing pneumothorax by improper insufflation is stressed. Pneumothorax is a condition that probably occurs much more frequently than the literature indicates. Obstetricians should be mindful of its possibility, especially when any method of artificial respiration has been employed.

In the discussion 4 more cases were detailed. One infant died.

EDWARD L. CORNELL, M.D.

THE HORMONAL TREATMENT OF BENIGN ENLARGEMENT OF THE PROSTATE

Collective Review

WILLIAM E. LOWER, M.D. F. C. SCHLESINGER, M.D. and E. E. FERGUSON, M.D.
Cleveland, Ohio

INTRODUCTION

THE symptomatology of enlargement of the prostate gland which so frequently occurs in men past fifty years of age has been recognized from time immemorial. Mention was made of the prostate as early as 1563 by Nicola Massa and about the middle of the sixteenth century brief reference was made by Rhodanus to obstruction at the neck of the bladder caused by swelling of the prostate. It is of interest that the first attempts to correct this disease of the prostate were made by way of the urethra rather than by open operation.

In 1834 Guthrie (33) introduced for the division of the median lobe at the neck of the bladder a catheter carrying a concealed knife. Merder (57) in 1837 devised special instruments called prostatotome and prostatectome. Bottini (5) introduced an electrocautery operation for correction of bladder-neck obstruction. Freudenberg (30) improved upon this instrument in 1897 and Young (93) punch instrument, developed later was a modern refinement of these earlier instruments.

Early in the nineteenth century there was also developed perhaps because of inadequacy of transurethral methods, perineal prostatectomy by Sir William Ferguson (94). In 1891 Goodfellow (94) performed a similar type of operation. Development of the suprapubic route followed very soon. There has been considerable controversy as to who truly placed the suprapubic method before the profession. Belfield (94) in 1886 did his first suprapubic removal of the prostate. However many attribute the introduction of this procedure to McGill (94) of Leeds. Freyer (94) also makes claim to being the first to remove totally the prostate by the suprapubic route. However probably the most valid claim of priority is that of Fuller (94) of New York who, it is said, performed the first total prostatectomy suprapubically.

Enthusiasm for prostatectomy by the perineal route was again kindled in 1901 by Ferguson and Albarran (94). Murphy (94) in 1902 Young (94) and

Senn (94) in 1903. The open operation by either the suprapubic or perineal method was in vogue for many years. However as newer mechanical methods were developed a renewed interest was evidenced in a treatment of this disease through the urethra.

In 1911 Young (9) perfected an instrument which embodies the principles of the early Merder punch. Stevens (77) in 1913 used a controlled electrocoagulating instrument. The cold-punch principle was also improved upon by Braasch (6) and McCarthy (48) with a direct vision scope. Caulk (14) in 1920 employed a similar principle but introduced the cautery blade in place of the cold knife. The development of intricate lens and mirror systems then brought the Stern (76) resectoscope into use in 1926. Davis (21) improved upon Stern's scope and spark-gap generator and in 1931 McCarthy brought out the resectoscope with the cautery loop. Braasch and Thompson several years ago again employed the cold knife principle in a new instrument. In this manner the transurethral method of resecting the prostate has developed during the past few years. This procedure has been utilized by many surgeons, some with good results and others with poor results. Any surgical procedure always carries with it a percentage of mediocre results and a certain risk, and perhaps it is these factors which provide the impetus for investigation resulting in better methods of treatment.

Benign enlargement of the prostate has long been recognized as a disease of old men. Therefore it manifests itself clinically at an age which sometimes is referred to as the male climacteric. We may then assume that perhaps benign enlargement of the prostate is associated with the hormonal changes which occur at that time. The testicle was first shown to possess an internal secretory action by experimentation with transplantation studies by Berthold (3) in 1849. In 1859, Brown-Sequard (8) based his ideas of internal secretions largely upon the rejuvenating effects he observed on himself following injections of dilute saline extracts of testis tissues. Actual

extraction, concentration, and isolation of these hormones was much delayed. Real progress in the development of hormonal control of benign enlargement of the prostate has come only since 1926, and even more so since 1931 when the first successful methods of extraction were introduced.

Experiments and observations have led us to believe that prostatic hypertrophy can no longer be regarded as a surgical entity alone. The interrelationship between the anterior pituitary gland, testes, and secondary sex organs in lower animals is now clearly recognized, and such an association may also exist in man. We must, therefore, assume that benign enlargement of the prostate may be due to an endocrine disorder.

Following a brief synopsis of the experimental work which led to the establishment of these facts, we propose to review and evaluate the results obtained from the clinical application of these hormones in the treatment of benign enlargement of the prostate.

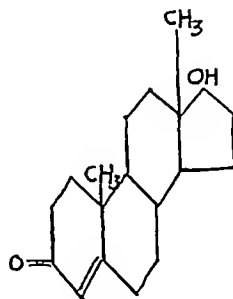
HORMONAL CONTROL OF CHANGES IN THE PROSTATE

A. EFFECT OF THE MALE HORMONE

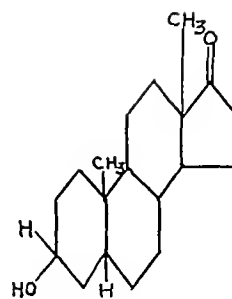
It has been definitely established that the castration of a young animal prevents the mature development of the accessory sex organs and that the secondary sex characters fail to make their appearance. Transplantation of the excised testicular tissue into another part of the animal's body prevents the occurrence of these castration effects.

These results of castration and transplantation experiments leave no doubt that the testis is a gland of internal secretion. It was Berthold (3) in 1849 who made the first experimental approach to the study of the function of the testes when he showed the effects of castration on cocks and also demonstrated that if testicular transplants became vascularized in the abdomen of these capons, the male sex characteristics were preserved. Leydig (81), von Ebrer (81), and Kolliker and Hofmeister (81) established the existence of the tubular portion and also of the interstitial cells in the testis. Pezard (67), in 1918, began experiments with testicular extracts, using the cock's comb as an indicator.

McGee (55) (1927) obtained an active lipid extract of bulls' testes. In 1929 Loewe and Voss (43), and Funk, Harrow, and Lejwa (31) prepared extracts from male urine similar to those of testicular extracts. The active principle in these extracts was isolated in 1931 by Butenandt (10) who termed it *androsterone*. In 1934 and 1935



Testosterone



Androsterone

Ruzicka (70) synthesized androsterone from cholesterol. It was in this year, also, that David, Dingemans, Freud, and Laqueur (20) isolated a crystalline substance, strongly androgenic, from bulls' testes, and called it *testosterone*.

Testosterone was synthesized from cholesterol in 1935 by Butenandt (11) and Ruzicka (71) at practically the same time. Like androsterone, it is a steroid. These compounds are characterized by a ring system consisting of three benzene rings arranged in a manner known from phenanthrene and a ring with only five carbon atoms. This chemical skeleton also forms the basic structure for cholesterol, ergosterol, the bile salts, and the female sex hormones.

Androsterone was found to be much less active than testosterone (from one-seventh to one-tenth). These compounds, having the qualities of an alcohol, are able to form esters. Esters of these steroids were first prepared by Miescher (58), who showed that the *propionate of testosterone* had a more pronounced and persistent action than did the free testosterone, although the maximum effect was obtained later. This effect is due probably to the fact that after absorption the ester is slowly metabolized with the formation of the free hormone, the same effect being produced as follows the frequent administration of hormone.

Following McGee's (55) work in 1927, Moore, Gallagher, and Koch (59) demonstrated, among other effects, the prevention of the atrophy of the accessory male organs (seminal vesicles, prostate, and Cowper's glands) by the use of testicular extracts in the castrated guinea pig, rat, or mouse. In 1930 Moore, Price, and Gallagher (61) showed that with injections of male hormone a normal rat prostate could be regenerated in twenty days, after the animal had been castrated ninety days previously. McCullagh, Cuyler, and Frawley (51) (1932), working with male hormonal extracts extracted from urine, which they termed "*androtin*," found that they were able to control the atrophy

of the prostate gland in a rat. These workers also found that injections of androth into a normal animal over a period of time caused a definite enlargement of the prostate. Numerous other workers have also established the fact that injections of male hormone cause rapid growth in the size of the prostate in immature or non-castrated animals. Zuckerman and Parkes (97) believe the action to be on the fibromuscular stroma and glandular elements. The uterus masculinus was not affected.

How ever the pathological physiology is not as clear as the normal physiology. As early as 893, White (89) suggested castration for the treatment of benign prostatic enlargement of the human being because of the belief, prevalent then, that the uterus and prostate were homologous. At this time oophorectomy was being employed in the treatment of fibrocyoma teri. In 1895 Whit (90) reported a marked reduction in size of the prostate enlargement in 87 per cent of the cases subjected to bilateral castration. Soon after this, numerous surgeons reported cases of benign enlargement of the prostate which were relieved or cured by castration.

On the other hand, many workers found that although some showed improvement following castration, the majority of the patients had very little benefit. Deming, Jenkins, and von Wagenen (95) in 1935 demonstrated that an adenoma of the prostate did not reduce in size nor did the clinical symptoms disappear over a period of one month following double castration. Later these same workers (96) presented the case of a seventy four year-old man who had developed benign enlargement of the prostate fifty years following castration.

B. EFFECT OF THE FEMALE SEX HORMONE

In early reports, Lacazeagne (40) Korenchevsky and Dennison (38) Zuckerman and Parkes (98) Burrows (9) DeJongh (3) and others put forth the theory based on experimental animal work, that benign enlargement of the prostate was the result of changes produced by estrogenic substances.

These workers, experimenting with rats, found that at first there was reduction in the number of glands in the dorsal lobe of the prostate, and an increase in the fibromuscular stroma. The epithelial cells then multiplied and a metaplasia with stratification of the epithelium occurred. Zuckerman (98) working with monkeys, confirmed their work and reported that if testosterone propionate was given with the estrone these changes were prevented. Reports from other workers conflict

with the above. Weller, Oberholzer and Nelson (88) (1926) and Moore and Price (60) (1932) obtained a decrease in the size of the prostate with the prolonged administration of estrone. They were of the belief that this resulted partly from the direct action of the estrogenic substance on the prostate but more probably because of the suppression of the activity of the anterior pituitary body. Korenchevsky and Dennison (39) (1935) reported a decrease in weight of the non-castrated rat prostate after the administration of estrin as well as hypertrophy of the adrenals and hypophysis. In the castrated rat, however the authors noted an increase in fibrous tissue and an epithelial metaplasia. These changes were also noted in some of the secondary sex organs. Von Wagenen (95) and Zuckerman and Parkes (98) (1936) did not find metaplasia in the true prostate glands of monkeys during the prolonged administration of estrone. The chief effect of the estrogenic substance was a stratification of the epithelium of the ducts, the accessory seminal vesicles, and the lower half of the prostatic urethra.

Del Castillo and Pinto (24) (1937) working with rats, found that small doses of estrone caused atrophy of the prostate and testicles but larger doses over a shorter period produced an increase in the weight of these two organs. If testosterone were added to the latter doses, the prostate became even larger. Geschickter (5) (1937) also believed the effect of estrin on the monkey prostate varied with the dosage. He found that moderate doses produced a slight enlargement by an increase in the fibromuscular stroma whereas large doses decreased the size of the prostate apparently through pituitary suppression.

Vidgoff (83) (1939) states that it is well known that estrogenic substance is a general epithelial stimulant.

C. EFFECT OF THE PITUITARY GLAND

It was demonstrated by Smith and Engle (74) as early as 1917 that following hypophysectomy there is atrophy of the prostate which can be completely repaired by reimplantation or the injection of pituitary substance. Walsh, Currier and McCullagh (86) showed that this atrophy could also be prevented by the parenteral administration of male hormones. Smith and Engle (75) also demonstrated an increase in the size of all the male reproductive organs except the testis in young rats and mice after the implantation of pituitary gland tissue. Moore and Price confirmed these results in 93.

In the early experiments on rats, Brooha, Hinglah, and Simmonet (7) (1930) Lower and

Johnston (46) (1931), and Zondek (95) (1935) showed that the anterior-pituitary-like hormone in pregnancy urine would cause enlargement of the prostate in non-castrated males. Geschickter (32) (1937) used the same material in the monkey and produced diffuse enlargement of the prostate. He found that removal of the testes or injury of the testes or prostate by irradiation prevented the prostatic response to this hormone. Focal or suburethral hypertrophy (as seen in human beings) was not seen in the monkey.

Hypertrophy of the prostate occurs in the normal male partner of a parabiotic union with a castrated rat. The stimulation of the testes of the normal partner by the hypertrophied pituitary of the castrated animal is the explanation of this phenomenon (Martins and Rocha (47), 1931, McCullagh and Walsh (52), 1935).

Ferguson (29) in 1933, in a study of 117 cases of teratoma testes, noted diffuse enlargement of the prostate and seminal vesicles, accompanied by hyperplasia of the interstitial cells of the opposite testis varying in degree with the amounts of anterior-pituitary-like substance in the urine.

Powell (68) (1939) noted benign enlargement of the prostate in a seventeen-year-old boy being treated with an anterior-pituitary-like gonadotropic substance. The prostate was enlarged to the point of obstructing the urinary stream and there was a resulting bladder residue of 150 c cm.

Jones (37) (1939) investigated the possible anatomical relations between the pituitary and the prostate based on the study of specimens from 168 necropsies. In each instance the pituitary showed normal limits of variation as to gross and microscopic structure. In 51 cases of the 168 there was enlargement of the prostate and in 7 atrophy, in the remainder the prostates were normal.

THE RESULTS OF HORMONAL ASSAY STUDIES

Owen and Cutler (66) (1936) could find no difference in the amounts of prolan or estrogenic substances contained in the urine of normal men and those with prostatic enlargement. Hamilton, Deming, and Allen (34) (1936) were unable to extract any estrogenic substance from 20 specimens of urine from 7 individuals with prostatic enlargement before and after prostatectomy. This is a surprising finding as the urine of normal men always contains estrogenic substances in appreciable quantities. These workers also failed to extract any estrogenic substance from the 7 enlarged prostates.

McCullagh and Cuyler (54) (1937) observed that the Friedman test was positive in the major-

ity of their cases of benign enlargement of the prostate. A suitable technique for the measurement of gonadotropic substance in the urine of males has been worked out by McCullagh and Bowman (53) of the Cleveland Clinic and is in the process of publication. It is thought that this substance in men originates in the anterior pituitary gland and that the amount found in the urine reflects the activity of that gland. Present results indicate that many patients suffering from benign prostatic enlargement excrete large quantities of the gonad-stimulating hormone.

Champy (15) (1937) found the quantity of male hormone in the prostatic individual to be low or practically absent. Rusch and Kundert (69) (1937) made assays on the urine of 16 such individuals and declared that there was no change in the estrogenic substance but that the androgenic hormone was less than in a normal group.

INHIBIN THEORY OF PROSTATIC ENLARGEMENT

McCullagh (50) in 1932 noted that the lipid-soluble male hormone maintained the size of the secondary sex glands but failed to correct the hypertrophy of the pituitary gland after castration. From this he postulated the existence of a second male hormone which had as one of its main functions the depression of pituitary-gland activity. Hence he named this hypothetical substance *inhibin*.

From this work and earlier postulates and experiments of his own, McCullagh formulated a hypothetical cause for benign prostatic enlargement. Although existing knowledge necessitates some changes in the original concept there can no longer be doubt concerning the existence of more than one testicular hormone. As early as 1923, Mottram and Cramer (63) had shown that following irradiation of the testes the tubular elements underwent degeneration while the interstitial elements remained normal. Accompanying these changes there was a definite change in the pituitary gland which simulated that which follows castration. No atrophy of the secondary sex glands was noted, so these authors concluded that one testicular mechanism controls the pituitary gland while another is responsible for the maintenance of the accessory sex organs.

It has also been shown that if the testes are placed in the abdomen so that the gametogenic elements are destroyed, the pituitary gland becomes hypertrophied and can be shown to be hyperactive by experiments with transplantation. Here the interstitial cells are still active as shown by maintenance of the secondary sex glands.

of the prostate gland in a rat. These workers also found that injections of androsten into a normal animal over a period of time caused a definite enlargement of the prostate. Numerous other workers have also established the fact that injections of male hormone cause rapid growth in the size of the prostate in immature or non-castrated animals. Zuckerman and Parker (97) believe the action to be on the fibromuscular stroma and glandular elements. The uterus masculinus was not affected.

However the pathological physiology is not as clear as the normal physiology. As early as 1893, White (89) suggested castration for the treatment of benign prostatic enlargement of the human being because of the belief prevalent then, that the uterus and prostate were homologous. At this time oophorectomy was being employed in the treatment of fibromyoma uteri. In 1895 White (90) reported a marked reduction in size of the prostatic enlargement in 87 per cent of the cases subjected to bilateral castration. Soon after this, numerous surgeons reported cases of benign enlargement of the prostate which were relieved or cured by castration.

On the other hand, many workers found that although some showed improvement following castration, the majority of the patients had very little benefit. Deming, Jenkins, and von Wagener (25) in 1935 demonstrated that an adenoma of the prostate did not reduce in size nor did the clinical symptoms disappear over a period of one month following double castration. Later these same workers (26) presented the case of a seventy-four year-old man who had developed benign enlargement of the prostate fifty years following castration.

B. EFFECT OF THE FEMALE SEX HORMONE

In early reports, Lacasagne (40) Korenchewsky and Dennison (38) Zuckerman and Parker (98) Burrows (9) DeJongh (23) and others put forth the theory based on experimental animal work, that benign enlargement of the prostate was the result of changes produced by estrogenic substances.

These workers, experimenting with rats, found that at first there was a reduction in the number of glands in the dorsal lobe of the prostate and an increase in the fibromuscular stroma. The epithelial cells then multiplied and metaplasia with stratification of the epithelium occurred. Zuckerman (98) working with monkeys, confirmed their work and reported that if testosterone propionate was given with the estrone these changes were prevented. Reports from other workers conflict

with the above. Weller, Oberholzer and Vebke (88) (1926) and Moore and Price (60) (1932) obtained a decrease in the size of the prostate with the prolonged administration of estrone. There were of the belief that this resulted partly from the direct action of the estrogenic substance on the prostate but more probably because of the suppression of the activity of the anterior pituitary body. Korenchewsky and Dennison (39) (1935) reported a decrease in weight of the non-castrated rat prostate after the administration of estrone as well as hypertrophy of the adrenals and hypophysis. In the castrated rat, however the authors noted an increase in fibrous tissue and an epithelial metaplasia. These changes were also noted in some of the secondary sex organs. Von Wagener (85) and Zuckerman and Parker (98) (1936) did not find metaplasia in the true prostate glands of monkeys during the prolonged administration of estrone. The chief effect of the estrogenic substance was a stratification of the epithelium of the ducts, the accessory seminal vesicles, and the lower half of the prostatic urethra.

Del Castillo and Pinto (24) (1937) working with rats, found that small doses of estrone caused hypertrophy of the prostates and testicles but high doses over a shorter period produced an increase in the weight of these two organs. If testosterone was added to the latter doses, the prostate became even larger. Geschickter (32) (1937) also believed the effect of estrin on the monkey prostate varied with the dosage. He found that moderate doses produced a slight enlargement but an increase in the fibromuscular stroma, whereas large doses decreased the size of the prostate apparently through pituitary suppression.

Kligoff (83) (1930) states that it is well known that estrogenic substance is a general epithelial stimulant.

C. EFFECT OF THE PITUITARY GLAND

It was demonstrated by Smith and Engle (74) as early as 1927 that following hypophysectomy there is hypertrophy of the prostate which can be completely repaired by reimplantation or the injection of pituitary substance. Walsh, Cuyler, and McCullagh (86) showed that this atrophy could also be prevented by the parenteral administration of male hormones. Smith and Engle (75) also demonstrated an increase in the size of all the male reproductive organs except the testis in young rats and mice after the implantation of pituitary gland tissue. Moore and Price confirmed these results in 1931.

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the mucosa just above the veru, which he believed to be descended from the muellerian duct and which was not found in younger males

Wugmeister (91) (1937) thought that benign enlargement of the prostate was due to a deficiency of estrogenic substance normally present in males. This resulted in a hypervirilization which he believed should be treated with estrone. He carried out this treatment in 23 cases with marked functional improvement and a decrease in the size of the prostate

EVIDENCE AGAINST HORMONAL CONTROL OF THE PROSTATE

Deming, Jenkins, and von Wagenen (25) in 1935 confirmed the ideas of Randall who believed that prostatic hypertrophy arose from the lateral lobes of the prostate, the prespermatic lobe of the prostate, and the submucosal glands of the prostatic urethra and trigone. They demonstrated that castration had no effect on the submucosal glands of the posterior urethra and trigone, the seat of 50 per cent of all prostatic enlargement. In 1935 Deming (26) was of the opinion that the remaining 50 per cent arose in the prostatic tissue and that here the normal tissue was atrophied, probably because of pressure from the adenoma. Hence, he concluded, it was useless to give a hormone to cause the further atrophy of an already atrophied gland. More recently (1939), however, Deming and Wolf (27) have put forth the idea that the components of the prostate gland responsible for benign enlargement of the gland were the muscle fiber, originally part of the lower muellerian tube and the prostatic ducts. The process, according to Deming, begins as a solid fibromuscular mass in the muscular wall of the prostatic urethra. This mass stimulates an epithelial proliferation of the ducts. The primary tumor is then invaded by the duct epithelium, which forms glandular tissue and grows more rapidly than the stroma, hence, the mass may appear wholly glandular. The glands of Albarran and the glands of the posterior and lateral lobes are not involved in the early phases of development. Deming and Wolf also state that benign enlargement of the prostate is composed of *hyperplastic* and *not hypertrophied* tissue. They compare the growth of the uterine myoma and note that hypothetically they have a *common anlage*.

Teem (80) (1936) presented a case of carcinoma of the genitaloid cells of the testis accompanied by practically an absence of interstitial cells in a man sixty-five with benign enlargement of the prostate. He also included 3 cases of interstitial-

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CLINICAL APPLICATION OF THE MALE HORMONES IN BENIGN PROSTATIC ENLARGEMENT

The hormonal treatment of benign enlargement of the prostate, in the main, has been based upon one of the two etiological theories brought forth in our discussion of the experimental work. Those who believe in the bisexual concept have used some form of the male hormone in an endeavor to overbalance the effect of the estrogenic substance. On the other hand, those who favor the inhibin theory have given preparations which they feel contain the water-soluble fraction "inhibin." This substance, they believe, inhibits the action of the pituitary gland upon the testes and thereby prevents an overproduction of the lipid-soluble male hormone.

Many workers have noted good results from the administration of the lipid-soluble male hormone. Perhaps one of the earliest substances was *hombreol*, used by von Capellan (12) and Laqueur (41) in 1934. Laqueur reported definite improvement in 66 per cent of the patients treated with this preparation. Some months later von Capellan reported 50 cases which had been under treatment and noted that 50 per cent showed favorable improvement of both objective and subjective symptoms. Although there was a definite reduction in the amount of residual urine, there was some question as to the diminution in the size of the prostate gland. This series of cases included all types of benign prostatic enlargement.

Testosterone propionate has been the most widely used preparation of all the male hormones. Laroche (42) and his coworkers (1937) using testosterone acetate as well as the propionate relate that a diminution in the size of the enlarged prostate was obtained. However, they

Martins and Rocha (47) (1931) reported that if a castrated male rat and a normal one are united in parabiosis (cello-anastomosis) the prostate and seminal vesicles of the normal animal undergo *hypertrophy* while the prostate of the castrated animal *atrophies*. However if the castrated partner is injected with a testicular mush the hypertrophy of the prostate in the other animal is prevented. They believe that the testicular mush contains a substance which depresses hyperactivity of the castrated animal's pituitary gland. This suppression in turn prevents an overstimulation of the testes of the normal partner and subsequent prostatic enlargement.

McCollagh and Walsh (52) confirmed the results of Martins and Rocha (47) and also demonstrated similar results using the injection of *lipoid soluble androst* with the exception that the accessory sex glands of the castrated animal were maintained. As there had been a marked decrease in the size of the accessories of the castrated animals used in the experiments utilizing a testicular mush it was theorized that some active principle other than the lipoid-soluble one might be present in the testes.

The next step was to inject the expressate of whole beef testes into a number of normal rats with resulting diminution in the size of the secondary sex organs. This was contrary to the results obtained with injections of androthio. To elicit further proof a lipoid-free beef testicular expressate was injected into normal rats and prostatic atrophy was produced.

McCollagh's resulting conclusions as to the etiology of benign prostatic enlargement have been termed the *inhibin theory*. His explanation of the condition was that if this inhibitory substance which is intimately connected with gametogenic elements of the testes tends to disappear in the later years of life the pituitary gland will hypertrophy. This results in an overproduction of the gonadotropic substance and stimulation of the interstitial cells with an enlargement of the prostate and accessory glands.

The substance *inhibin*, known to be water soluble, has never been isolated in its pure form. The cell of its origin has not been definitely established, but the bulk of evidence as noted above points toward the gametogenic elements.

Evidence which supports the *inhibin theory* was brought forth in 1933 by Myers, Vidgoff and Hunter (64). These workers produced atrophic changes in the prostates of rats fed desiccated beef testes. It is well known that the lipoid-soluble hormone which causes prostatic hypertrophy in experimental animals is inactive

when given orally and in any case is present only in minute amounts in beef testes. This is demonstrated by the fact that David and Laqueur used 1 ton of bull testes to produce from 150 to 270 mgm. of testosterone.

Later (1936) one of these investigators (Vidgoff) (84) injected lipin-free desiccated bull testes into normal adult male rats. There was a resulting decrease in the weight of the prostate as well as atrophic and degenerative changes simulating the changes seen in castrated rats.

It is interesting here to note the work of Teem (80) in correlating the size of the prostate with the macroscopic findings in the testes. He found that the decrease of the average number of interstitial cells is parallel in subjects with benign enlargement of the prostate and in those who have a normal prostate up to the age of sixty-nine. After this age the average number of interstitial cells in those with benign enlargement of the prostate decreases more rapidly than in those with normal glands. He concludes that the secretion elaborated in the interstitial cells is in the nature of an *andihormone*. On the other hand, a good state of preservation of seminiferous tubules and spermatogenesis was frequently seen in men between the ages of forty and eighty-nine.

BISEXUAL THEORY OF PROSTATIC ENLARGEMENT

Some workers believe that the prostatic adenoma develops from anatomical formations of female origin in the prostate. This idea has been hypothesized from the effect of the estrogenic substance on the prostate of experimental animals. This view is based also on the supposition that the male elaborates an estrogenic substance and also that the prostatic enlargement occurs only when the male hormone is deficient.

Moszkowicz (62) (1932) was of the belief that the prostate is formed of a bisexual part and a male part and that prostatic enlargement takes place at the expense of the bisexual part.

Zuckerman (96) (1936) put forth the theory that the male produces a male hormone and an estrogenic substance so balanced that the estrogenic powers are inhibited. In the so-called male climacteric this balance becomes altered so that the estrogenic phase becomes dominant. It then exercises its own power to produce changes resulting in the benign enlargement of the prostate.

Cunco (18) (1936) believed that the appearance of the prostatic enlargement between the ages of fifty and sixty was an indication of impaired secretion of the male genital gland. He found in men past forty a group of utricular glands under

the mucosa just above the veru, which he believed to be descended from the muellerian duct and which was not found in younger males

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Testosterone propionate has been the most widely used preparation of all the male hormones. Laroche (42) and his coworkers (1937) using testosterone acetate as well as the propionate relate that a diminution in the size of the enlarged prostate was obtained. However, they

pointed out that this was due probably to the alleviation of congestion and inflammation in the prostatic area.

Schmitz (2) (1937) treated 42 patients with testosterone propionate and stated that good results were obtained. Oberholzer (65) (1938) used testosterone propionate parenterally in the treatment of 34 patients with benign enlargement of the prostate. Five mgm. were administered for an average of ten or twelve days. Favorable results were obtained in 27 cases. The first improvement was noted from three to seven days after the beginning of the treatment. In this series improvement in kidney function was noted and, in some patients, a reduction in blood nitrogen retention. All showed a decrease in the pathological alteration of the urine with a marked decrease in functional symptoms. The size of the prostate was not altered in any of the patients. The improvement extended over a period of from three to six months following the last injection. An interesting observation made in those patients who also had hypertension was a marked reduction toward the normal blood-pressure level which continued for some time after the treatment was discontinued. Oberholzer concluded from his findings that the best results were obtained in those having an early benign enlargement of the prostate.

Cary (13) (1938) reported his first observations on 26 cases of prostatitis and benign enlargement of the prostate. Testosterone propionate was administered over a period of two months, twelve doses of 5 mgm. each being given. Favorable results were reported in 20 of these cases. In addition to the improvement of the subjective functional symptoms, there was a reduction in the amount of residual urine and, cystoscopically the prostate was thought to be smaller.

Further observations were made by Cary in 1 of the same patients. He found that while having received no treatment over a period of six months they remained in excellent condition. An additional 8 cases of benign prostatic enlargement were placed under hormonal treatment. In this series he again found a marked improvement in the subjective symptoms after only 3 injections of 5 mgm. each of testosterone propionate. After injections, there was a considerable reduction in the amount of residual urine.

Hamilton and Gilbert (35) in 1938 observed a group of well controlled patients with benign enlargement of the prostate. Using testosterone propionate they obtained favorable results in 7 of the cases treated. Improvement was noted in the subjective functional symptoms as well as a

reduction in the residual urine. These authors are of the opinion that the benefit derived from the treatment was due in a large part to stimulation of the body vigor and muscular tone. It was observed with continued treatment, that even though there was further enlargement of the prostate the symptoms did not reappear.

Day (22) Belt (1) and Strohm, Edelson, and Merryman (79) (1938) reported favorable results from the use of testosterone propionate. Strohm found the results less favorable in those patients in whom the obstructive symptoms had been of long duration and the gland quite large. He noted a marked decrease in the size of the gland in 2 cases.

Boland (4) (1939) treated 23 cases: 12 of benign enlargement, 9 of benign enlargement with prostatitis, of carcinoma of the prostate, and 1 of postoperative resection dribbling. Ten milligrams of testosterone propionate were administered three times a week until from 150 to 300 mgm. were given. Forty three and six tenths per cent of the patients were rendered clinically well or symptom free while 30.5 per cent showed some improvement. Those who failed to show improvement were the patients with benign enlargement accompanied by a chronic infection of the gland. Five of these patients died of other causes.

In a later series of 35 cases Boland reports a higher percentage of beneficial results. This he attributes to the fact that the preparation was used only in patients with uncomplicated benign enlargement of the prostate.

Biopsy of the prostate was taken in these cases before and after the administration of testosterone propionate. These biopsies were taken with the Stern McCarthy resectoscope or with the Caulk punch. Microscopic examination revealed that following the administration of testosterone propionate there was (1) an exaggeration of glandular hyperplasia replacing the stroma, (2) a reduction or at least, no increase in the stroma, and (3) less evidence of chronic infection.

Turner (8) (1939) noted an enlargement of the prostate in individuals with hypogonadism treated with testosterone propionate. This confirmed the findings of Vest and many others. He also reported a patient with benign enlargement of the prostate who after receiving 10 mgm. of testosterone propionate three times a week for five weeks obtained complete symptomatic relief. The prostate seemed less turgid and reduced in size.

Sharpey Schafer (73) (1939) reported 1 case treated with massive doses of testosterone pro-

pionate This patient also had the benefit of suprapubic drainage It was noted that following treatment the prostate was but one-third of its former size Microscopic sections taken before and after the hormonal therapy showed no difference in the structure of the tissue The author was of the opinion that reduction of the prostate may have been the result of the suprapubic drainage

Stumpfi (78) (1938) treated a series of patients with benign enlargement of the prostate by using testoviron, which is a lipoid soluble male hormone similar to testosterone He gave from 220 to 2,020 mgm over a period of from twelve to fifty-eight days He also observed the prostate and bladder neck through a suprapubic fistula in each case, and noted that the prostate became larger following the administration of the testoviron He did state, however, that some patients emptied the bladder with greater ease, but presumed this to be due to the increased tonus of the bladder musculature

A few clinicians have used androstine, which is a glandular preparation, the "A" portion containing the water soluble active principles and the "B" portion the lipo soluble active principles of the male genital glands The preparation in tablet form combines the two portions

Androstine "B," the lipo soluble fraction, has properties similar to testosterone propionate, while the water soluble portion, Androstine "A," is essentially the same as McCullagh's substance which he terms "inhibin" This preparation has been used by some workers because it was believed that androstine utilizes therapeutically all the active androgenic substances of the testicle

Erdelyi (28) (1937) observed a number of patients with benign enlargement of the prostate following the parenteral and oral administration of Androstine A and B One ampoule was given daily for a period of twelve days, alternating the A and B fractions Twelve more injections were given, one ampoule every other day The treatment was completed by giving the tablets for a period of eight weeks following the last injection Erdelyi concluded from this study that there was an improvement in the general condition of the patients, the urine passed more freely, and the nocturia was diminished, but there was no change in the size of the prostate He made the suggestion that the operable cases be treated with surgery and the inoperable cases be administered androgenic hormones

Walther and Willoughby (87) (1938) combined the use of androstine and of testosterone propionate in 12 cases and found that all responded most favorably

Meltzer (56) (1939) also combined the use of androstine and of testosterone propionate in 22 patients with benign prostatic enlargement He gave 30 injections, each containing 25 mgm of testosterone, and 1 ampoule of androstine, alternating A and B Later a maintenance dose of 10 mgm was given each week Forty-five per cent of these cases showed marked improvement of all subjective symptoms There was no change in the size of the prostate nor any decrease in the amount of residual urine

The use of the water-soluble fraction termed inhibin was favored by those who were advocates of the theory that this androgen exerted an inhibitory action on the anterior pituitary lobe This organ in turn prevented an overproduction of the lipo soluble male hormone, which, to these workers, was the causative factor in the production of benign enlargement of the prostate

Lower, Engel, and McCullagh (45) (1935) administered desiccated beef testes orally to 76 patients suffering with benign enlargement of the prostate Each patient received the equivalent of 60 gm of fresh beef testicular tissue daily Forty-eight cases or 63 per cent were believed to show improvement It was believed the treatment was most suitable in that type of case in which there was present an enlarged, rather succulent soft gland The type of gland present and results obtained are shown in Table I

TABLE I

Type	Improved and symptom free	Unimproved	Total
Simple bilateral enlargement	14	10	24
Trilobar enlargement	17	9	26
Middle lobe enlargement	4	4	8
Not specified	13	5	18

The first signs of improvement after treatment with inhibin was instituted were decreased nocturia, greater ease in voiding, increase in the caliber of the stream, and reduction in frequency of urination All patients reported a feeling of general well-being No definite reduction in the size of the prostate gland could be established in any of the cases treated No discernible difference in the histological appearance of the prostate tissue was noted following treatment Experimentally in animals, however, there was a marked change in tissue structure both grossly and microscopically

Further observations were reported in 1937 by Lower (44) on the cases mentioned previously and an additional 75 patients were placed under

treatment. At this time a total of 57 per cent of the patients had experienced or continued to experience relief from their functional symptoms. Those placed under inhibin therapy in 1935 continued to respond favorably only if a maintenance dose of 20 gm., or one-third of the original dose was administered daily. It was found that if the preparation was discontinued completely the patient's bladder neck obstructive symptoms soon returned.

McComb and Pearse (49) (1937) working in close collaboration with Lower a group treated 17 patients with this same preparation. They obtained improvement in 46.6 per cent of their cases, but 53.3 per cent did not respond. Concurrent urethral catheter drainage was used. The average time on inhibin before the catheter was removed permanently was thirty-one days. There was no reduction in the size of the gland either by rectal digital examination or cystoscopically. These authors stated that those patients showing improvement emptied their bladders, and did so easily following this therapy.

Cunco (19) (1936) administered a total hydroglycerine extract of bulls testes to 18 patients and obtained a decrease in the size of the prostate and alteration of the symptoms in 60 per cent of his cases.

Bergmann (2) (1937) gave a water-soluble preparation and claimed good results. However no details were included as to the type of case, dosage of the drug, or length of administration of the drug.

Champy (16) (1939) reported favorable results with a testosterone free testicular hormone given parenterally.

Approximately from 40 to 60 per cent of the patients treated with either or both the liposoluble or water soluble preparations have obtained relief of their functional symptoms. In only an occasional case was any change noted in the size of the prostate. However, numerous cases were reported in which the bladder residuum was definitely diminished following the onset of hormonal therapy. All patients claimed feeling of general well being.

Testosterone propionate was the preparation most widely used. The usual dosage has been from 0 mgm. to 5 mgm. two or three times weekly for period from ten days to two months. A maintenance dose of 10 mgm. weekly was advised following the initial course of treatment.

In this review of the literature on the clinical application of the hormonal preparations one is quite obviously impressed with the fact that the results in many of these cases have been rather

hastily evaluated. Certain features of the clinical investigation have been omitted while the duration of treatment and period of follow up have been entirely too short.

After carrying on at the Cleveland Clinic considerable animal experimentation and clinical experimental work on the hormonal etiology and therapy of benign enlargement of the prostate we believe that the following plan of investigation will afford the maximum amount of information.

The presenting patient should have:

- I. History and physical examination—to include endocrinological observations
- II. Cystoscopic examination with calculation of the residual urine, cystography and cystometric studies
- III. Laboratory work
 - A. Routine
 1. Blood counts
 2. Complement fixation
 3. Blood sugar
 4. Blood urea
 5. Blood non protein nitrogen
 6. Urinalysis and culture of bladder urine
 - B. Kidney function
 1. Intravenous phenolsulfonphthalein
 2. Urea clearance
 3. Intravenous excretory program
 - C. Hormone assays, forty-eight hour urine specimens
 - Gonadotropic substances
 3. Estrogens
 3. Androgens
 - D. Semen examination

If one intends to start hormonal therapy after a thorough evaluation of the facts obtained from the above mentioned procedures, a biopsy of the prostate gland should be done.

During the course of the treatment the patient should be kept under careful observation. Every effort must be made to effect any change in the size of the prostate. This should be done by cystoscopic examination or with cystography. The patient's ability to empty his bladder can be determined by frequent cystometric studies and measurement of the bladder residuum. The third important observation is to note any change in the tissue structure of the prostate. Biopsy of the gland after a known period of treatment is, of course, the manner in which to check this condition. Forty-eight-hour specimens of urine should be collected at intervals during the course of treatment and the hormone content again determined. The effects of the hormone on spermatogenesis should also be followed.

The question arises as to the dosage, the advisability of a maintenance dose, and the length of a period of observation following treatment. These points have not been satisfactorily established and only by exact scientific investigation will they be determined.

The clinician should maintain a group of similar cases without treatment to be used as controls. It has been shown by Clarke (17) and others that benign enlargement of the prostate in the human being may undergo spontaneous amelioration. Hinman (36) states that 50 per cent of the men who develop prostatic enlargement never have obstructive symptoms and, in a number who do, the trouble is only temporary. As most of the patients under hormonal treatment obtain a feeling of well-being the psychic effects of the therapy must be evaluated.

CONCLUSIONS

1 A definite relationship between the testes, prostate, and pituitary gland in animals has been established. However, there is no conclusive evidence to prove that such an association is present in man.

2 The theories of etiology of benign enlargement of the prostate gland are conflicting and confusing. Since the type of enlargement of the prostate produced in animals does not coincide exactly with that seen in human beings, one cannot assume that the hormonal control of normal and pathological growth is identical. It may be possible that there is more than one cause of benign prostatic enlargement.

3 A lipid-soluble substance from the testis, isolated in pure form, has been shown to prevent atrophy of the secondary sex glands if administered parenterally to castrated animals. This same substance causes enlargement of the prostate in normal animals. There is also evidence to show that the testes elaborate a second male hormone, water-soluble in nature, which has an inhibitory effect on the prostate of animals. The application of these findings to the clinical care of prostatic enlargement awaits further investigation.

4 The results of the clinical use of hormones in benign enlargement of the prostate, which on the surface appear remarkable, are unconvincing if the work is thoroughly investigated. There has been no definite evidence that any of the so-called male hormones have an effect on the size of the prostate gland. The relief of functional symptoms reported by many with the use of hormones may then be assumed to be due to some mechanism other than the expected effect on the prostate gland.

5 From the present evidence we feel that further clinical application of the use of male sex hormones in the treatment of benign enlargement of the prostate should be purely from an investigative standpoint.

6 A method for the thorough study of this problem has been outlined.

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GENITO-URINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Shifflett, E. L., and Keith, D. V. Lateral Pyelography. *Am J Roentgenol*, 1940, 43, 664

Lateral pyelography is not recommended for a routine examination but it is frequently indicated and sometimes necessary. The technique requires that the patient be in an exact lateral position, with the questionable side next to the film. The side uppermost is subject to considerable distortion. The exposure should be the shortest possible. The roentgenogram should visualize the usual quantity of pyelographic medium or opaque catheter in the ureter and kidney. Occasionally, in large individuals an increase in concentration of the pyelographic medium permits a better visualization. The best results are obtained by the retrograde technique, but in pathological processes accompanied by stricture, lateral intravenous urography can be done quite satisfactorily.

The normal lateral pyelogram shows the shadow of the pelvis usually superimposed on that of the second lumbar vertebra, but sometimes on part of the first and second, or second and third lumbar vertebrae. The long axis of the renal pelvis and the spine correspond. The superior and inferior calyces extend up and down, respectively, but if there is some rotation of the kidney on its long axis, the calyces may point backward toward the spinous processes, or be visualized through the pelvis. The ureter descends in a smooth convex curve anteriorly behind the shadow of the vertebral bodies until it reaches the inferior margin of the fourth lumbar vertebra where it becomes anterior and passes downward just anterior to the fifth lumbar vertebra and the lumbosacral joint, then it becomes slightly convex posteriorly to deep in the pelvis, where it again comes forward to enter the bladder. The anterior surface of the ureter in relation to the peritoneum is fairly constant. Normal variations must be learned by experience. The lateral pyelogram should establish the type and the degree of rotation of the kidney and the anteroposterior position of the kidney and the ureter. The combination of types and degrees of rotation and displacement varies with different lesions and constitutes the essential basis of diagnosis from lateral pyelography, but this information must be correlated with that obtained from the routine pyelogram and the pathological behavior. The most significant combination is that of vertical rotation and displacement.

The authors have found the information obtained helpful and at times conclusive in the diagnosis of the following lesions: renal neoplasms and cysts, perinephric abscess, primary retroperitoneal tumors and infections, tumors arising from organs adjacent to the kidney, retroperitoneal metastatic growths, congenital and acquired abnormalities of the kidney

and ureter, and many miscellaneous conditions encountered in the investigation of the urinary tract.

Perinephric abscess causes predominantly anterior displacement of the kidney and the ureter associated with variable degrees of vertical and horizontal rotation. The amount of displacement depends upon the extent of the infiltration, the degree of suppuration, and the location of the suppuration. When these dynamic signs are correlated with acute pathological behavior, the diagnosis becomes relatively simple. It may be quite difficult, if not impossible, to differentiate a chronic indurated perinephric abscess from a retroperitoneal sarcoma without the evidence of acute pathological behavior.

Most cortical neoplasms can be detected from the routine pyelogram. Occasionally, the lateral pyelogram will give the only conclusive evidence of a renal neoplasm, permit the differentiation of retroperitoneal tumors displacing the kidney, or prevent the diagnosis of tumor because of a vertically rotated kidney. Cortical neoplasms cause predominantly vertical rotation, variable degrees of horizontal rotation, and little, if any, anterior displacement of the kidney or the ureter. If there is appreciable anterior displacement of the kidney and a localized segment of the ureter with evidence of an intrarenal malignant growth, the tumor has probably invaded perinephric structures and is probably inoperable. The authors suggest that the lateral pyelogram be employed in all cases suspected of malignant growth clinically or roentgenologically.

Large solitary cysts of the kidney cause considerable vertical and horizontal rotation without a comparable degree of anterior displacement, even when the cyst is huge, and most often there is no appreciable displacement. Cysts cause less compression deformity than a malignant tumor of like size, rarely distort the pelvis unless there is an associated infection, and often appear as an accessory rather than an incorporated mass because of the difference in the genesis of the lesion. There is practically always a mechanical hydronephrosis (general or partial), because of chronic compensation which is more often not present in malignant neoplasms on account of the more rapid growth of the latter. A great effort should be made to differentiate between small serous cysts and small neoplasms because the solitary cyst often causes no symptoms and a useless operation may be avoided. The differential diagnosis is particularly difficult when the small cyst involves the upper pole, because the law of probability favors a malignant neoplasm.

Retroperitoneal tumors include both the true retroperitoneal sarcoma and tumors originating from adjacent retroperitoneal organs, particularly the tail of the pancreas. Primary retroperitoneal tumors cause considerable anterior displacement which is always associated with a considerable degree

of horizontal and vertical rotation. This tends to differentiate them from perinephric abscess, which causes predominantly anterior displacement of the kidney and ureter and from primary renal tumors.

High cause predominantly vertical and horizontal rotation of the kidney without displacement or without appreciable displacement of the kidney and ureter. If retroperitoneal lesion is demonstrated it does not conform to these criteria another possible origin and the probable result of the physical force of the lesion must be considered. Its origin, if not its actual nature may be determined.

A good rule to follow is to make a lateral pyelogram. When the routine pyelogram leaves one in doubt as to the probable significance of some aberration from the average normal. Congenital and acquired lesions of the anteroposterior junction vague causes of partial and complete hydronephrosis unusual appearing pelvis, anomalies of development which might lead to clinical confusion, calcifications anterior or posterior to the kidney which may appear to be in the kidney pelvis because of superimposition, and differentiation between intra-abdominal and retroperitoneal masses, all lend themselves well to study by lateral pyelography.

LOUIS NEWKIRK M.D.

Neubert, R. N. and Dick, J. B. Acute Staphylococcal Infections of the Kidney. *J. Urol.* 1924, 43, 63.

Certain facts concerning the pathology, diagnosis, relationship to secondary organisms, complications, and treatment of 80 cases of acute staphylococcal renal infections are presented by the authors.

It is concluded that acute staphylococcal infections of the kidney are relatively common and are hematogenous in origin, the lesion being cortical and showing marked tendency to heal promptly and completely. The urine rarely contains pus, but the stained sediment reveals the presence of cocci. Secondary bacillary infection of the urine frequently occurs. Costovertebral pain, tenderness and fever are constant and the disease runs stormy but self-limiting course and ends in complete recovery.

Typical complications occur in approximately 50 per cent of the cases and their appearance is heralded by an increase in the patient's symptoms and signs. These complications (perinephric abscess and abscess of the kidney) are readily diagnosed and their onset should be treated by immediate drainage. Pulmonary complications of perinephric suppuration occur in 65 per cent of the cases and often cause delay in diagnosis and treatment of the underlying pathological lesion. They clear upon adequate treatment of the underlying subdiaphragmatic disease.

D. E. MARR M.D.

Capacci, P. The Early Diagnosis of Renal Tumors (La diagnosi precoce dei tumori renali). *Arch. ital. di urol.* 1940, 5.

Capacci finds that the number of cases of renal tumor which reach the operating table has not in-

creased lately which is contrary to what has been noted regarding tumors of the other organs. In various statistics show that about 5 per cent of the patient who are sent to the surgeon are inoperable. Early diagnosis seems to be the exception rather than the rule.

In order to discover what prevents the early recognition of renal tumor, Capacci has selected for discussion 34 cases of malignant tumor in adults which have been demonstrated by operation. He presents the data concerning the time of appearance of the first clinical manifestations of the disease, the results of the laboratory, endoscopic, functional, and roentgen examinations, and the operative findings. He points out that hematuria was the first symptom in 76 per cent of the cases and that pain (most often associated with hematuria) was the first symptom in 55 per cent. These percentages are remarkably higher than those given by the majority of the authors, i.e., 50 and from 30 to 35 per cent, respectively. On the other hand, he states that palpable tumor has no practical value as an early symptom and that laboratory examination of the urine can be corroborative only in certain cases. Endoscopic examination during the period of hematuria is of great significance, while functional tests are not. Roentgen investigation and especially retrograde pyelography are very valuable for the early diagnosis of the tumor. The biological tests have not fulfilled expectations up to the present time.

The early diagnosis of renal tumor is rather difficult problem which has not yet been solved in some of its aspects, but which can be solved in most cases. Retrograde pyelography is the most appropriate means for the purpose and is capable of revealing the presence of beginning and only slightly developed tumors. However the usefulness of the procedure depends on its early application, soon as the tumor has given any sign of its presence. The first sign is nearly always hematuria and therefore deserves the greatest attention. The reported case shows that in most of them too much time has been allowed to elapse between the appearance of the first symptom and the intervention. On the other hand, in a few of the cases in which the diagnosis was made soon after the observation of the first symptom, the tumor was found to be already markedly developed and advanced at the time of operation.

Consequently there are two reasons for the small lateness of the diagnosis of these neoplasms.

The tumor presents particularly silent or nearly silent course (the so-called latent form) and causes revealing symptoms only when it has already reached considerable proportions fatal for the patient. Surgery is useless in these cases.

In most cases too much time is allowed to pass after the appearance of the first suspicious symptom, which is usually hematuria. Yet there are the cases in which early diagnosis is possible and which deserve all the attention of the physician.

is the first to visit the hematuric patient. It happens all too often that this symptom is underestimated and even ignored by general practitioners whose most important duty consists in catching the first signs of the disease, evaluating them properly, and sending the patient to somebody who is capable of verifying the suspected diagnosis with all the available technical means.

Early diagnosis of renal tumor depends on the intimate collaboration between the general practitioner and the urologist. RICHARD KEMEL, M.D.

Everidge, J. Nephro-Ureterectomy. *Proc Roy Soc Med, Lond*, 1940, 33: 295

A review of the literature upon the subject of ureterectomy shows the fact that practically every article seeks either to advocate the wider adoption of the operation or to prove it is unnecessary. The greatest divergence of opinion is found with regard to tuberculosis, the least with regard to tumors. In a series of 30 operations, 24 of which were performed for tuberculosis, the author explains the pre-operative investigations, the technique of extraperitoneal nephro-ureterectomy, and the postoperative complications and results.

It is concluded that in cases of tuberculosis which require nephrectomy the danger of extending the operation to include a ureterectomy should not prevent the surgeon from removing a potent source of infection. D. E. MURRAY, M.D.

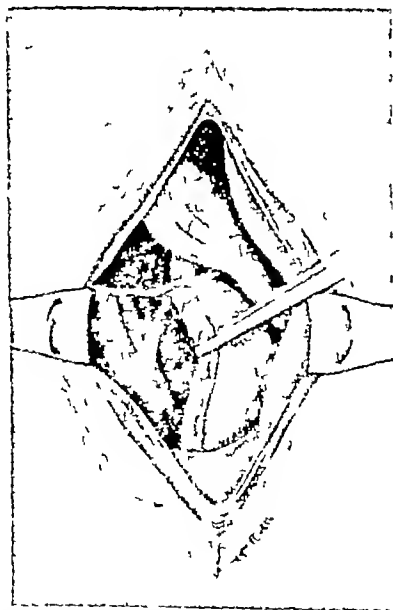


Fig. 1. Separation of the lower third of the ureter. The superior vesical artery has been divided and ligated to allow displacement and elevation of the bladder. The relation to the vas and great vessels is seen. The vertical Joly incision is used and the ureter is supported on a gauze sling.

Nichols, B. H. Ureteral Obstruction. *Am J Roentgenol*, 1940, 43: 649

The author's contribution on ureteral obstruction is intended, so he states, to make medical men "kidney conscious." Frequently, ureteral obstructions which may be the cause of the presenting symptoms are overlooked. He presents the anatomy and vascular supply of the kidney, and emphasizes the importance of the nerve supply. He states further that portions of the ureter seem to retain their peristaltic action even though all of the nerves which supply the ureter may be cut. Intermittent or partial obstruction of the ureter produces marked dilatation of the kidney, hydronephrosis and accompanying pain, urinary stasis with resultant infection, and often renal calculus formation. There may also be destruction of the kidney without accompanying pain.

The causes of ureteral obstruction are listed as follows:

A. Lesions of the kidney

1. Renal calculi
2. Tumor
3. Infections
4. Blood clots
5. Anomalous renal vessels
6. Anomaly of position
7. Duplex kidney
8. Fused kidney

B. Lesions of the ureter

1. Ureteral calculi: opaque and non opaque
2. Stricture
3. Tumors: primary and secondary
4. Trauma: ligation, cutting
5. Infection
6. Adhesions: congenital and acquired
7. Kinks
8. Congenital valves
9. Diverticulum
10. Duplication
11. Transplanted ureters
12. Ureterocele
13. Atrophic ureter
14. Megalo ureter
15. Ectopic ureter
16. Extrinsic pressure
17. Pregnancy

C. Lesions of the bladder

1. Tumors
2. Diverticulum
3. Infarction
4. Trauma

The author presents roentgenological studies with intravenous urography and retrograde pyelograms, which illustrate the various types of cases that are frequently encountered. He emphasizes the use of excretory urography as an aid in diagnosis.

He concludes that the urologist should be the judge as to diagnosis and management, and that the clinical history and the urological findings combined with roentgenological findings are all necessary in the final diagnosis. J. SYDNEY RITTER, M.D.

BLADDER, URETHRA, AND PENIS

Marini, A.: Direct Transurethral Treatment of
Rebellious Chronic Vesiculitis; A Clinical
Contribution (La terapia diretta transuretrale
della ecchiditi croniche ribelli contributo clinico)
Arch. Ital. di chir. 94 7 54

Marini recommends direct transurethral lavage of the seminal vesicles in cases of refractory chronic inflammation and describes McCarthy urethroscope and technique for the catheterization of the ejaculatory ducts. One of the advantages offered by the method is that it allows separate collection of the seminal fluid from each vesicle without the admixture of prostatic urethral secretion.

Among 56 cases of vesiculitis which came under his observation he treated 43 with transurethral lavage. All of these patients had been treated previously by various methods without showing any improvement, and they presented the usual subjective symptoms and objective signs. Urethroscopy revealed changes in the crumetatum in most cases such as hyperemia, edema, pallor and sclerosis. In 5 cases, there were small true papilloma close to the orifices of the ejaculatory ducts. Smears and cultures of the seminal fluid showed most frequently the presence of the gonococcus, and much more rarely the taphylococcus, streptococcus, and the bacillus coli.

A preliminary epidural injection of 30 ccm of 1 per cent solution of novocaine with 20 drops of adrenaline was given thirty minutes before the introduction of the urethroscope when epidural anesthesia was impossible, the patient received an enema with 30 to 35 drops of laudanum and 5 gm. of tincture, and urethral contact anesthesia by means of 1 ccm. of a pericaine or procaine solution. Lavage of the seminal vesicles, usually with a 1 per cent solution of electrargol was repeated from 3 to 8 times at intervals of from five to ten days, and progress was observed by bacteriological examination. One or two lavages were given after disappearance of the bacteria in order to consolidate the result. Bacterial infusions were used in some cases. During the intervals between lavages, the usual therapeutic means, which by themselves had remained without effect on these patients, were employed: massage, diathermic applications, the rectal electrode, urethral irrigation, vaccines, and urinary disinfectants administered intravenously (gonacrine, urotropine, streptocin). The only complication which occurred during the treatment was epididymitis on the day following the first lavage (2 cases). In some of the first patients treated, the temperature rose to 39 to 40 C a few hours after the lavage, but never for long and always sank to normal by the intravenous administration of nearly antiseptic. At present, urinary antiseptic is not injected after the lavage in order to prevent this possible rise of temperature. After completion of the treatment, patients experienced piercing pains during their first sexual intercourse and painful ejaculations which, however

disappeared spontaneously later. Of the 43 patients treated, 20 were cured, 2 were benefited, and 1 had no benefit.

RICARDO KIRIN, M.D.

Thompson, A. R.: Ijuries of the Urethra. *Br. J. Urol.*, 940, 20.

The author cites a case of rupture of the prostatic urethra, associated with fracture of the penis, in the region of the sacro iliac joint and the body of the pubis. Immediate suprapubic cystostomy with drainage was performed. The resultant stricture was subsequently repaired by perineal operation, and kept open by the passage of sounds. Three months later the patient was found to have a mild pyrexia without pain in the right side. A ray examination revealed stones in the right kidney. At operation a perinephritic abscess was found and drained, and the stones were removed by pyelotomy. After a period of six months, right nephrectomy was done, and later a right ureterectomy.

The author uses this case to substantiate his idea that the kidney lies in what he calls the renal process of the genital fascia. In this instance, he believes that the infection extended up into the periaortic and perirenal spaces and entered the kidney via the capsule.

In the case of gunshot wounds and other similar trauma, Thompson advises saving as much as possible of the urethral mucosa.

Referring to traumatic strictures of the urethra, he states that frequent observation is necessary; the stricture should be kept moderately dilated without further trauma or the production of pain. Internal urethrotomy is resorted to when necessary.

THEODORE P. GALLER, M.D.

GENITAL ORGANS

Huggins, C., and Stevens, R. A.: The Effect of Castration on Benign Hypertrophy of the Prostate. *Ann. J. Urol.*, 940, 43 705.

The effect of castration on benign prostatic hypertrophy is a debated question, and contradiction of opinion exists at the present time as to the effect of removal of the gonads on enlargement of the prostate gland.

In order to evaluate the conflicting evidence, castration of 3 patients with prostatic hypertrophy was carried out by the authors. Biopsy specimens of the prostate were secured at the time of castration, and also twenty-nine, eighty-six, and ninety-one days later. Epithelial hypertrophy was not present twenty-nine days after castration, but appeared plainly eighty-six and ninety-one days after the operation. In case there was marked reduction in prostatic size on rectal examination, and an increase in the size of the urinary stream within one month after castration.

The evidence derived from castration for benign prostatic hypertrophy in man supports the view that the prostatic epithelium, at least, is under the control of the testes.

D. E. MURRAY, M.D.

Gayet, R. Therapeutic Considerations and Operative Results in Diffuse Gangrenous Phlegmon of the Perineum (Considérations sur la thérapeutique et les résultats opératoires des phlegmons diffus gangreneux du périnée) *Icon chir*, 1939, 36, 661

Diffuse gangrenous phlegmon of the perineum or "extravasation of urine" has not disappeared even with the modern improved treatment of urethral strictures. In large medical centers 1 or 2 cases a month are seen.

From observation of approximately 20 cases the author states that, although the diagnosis is easy, the general medical man has no idea of the gravity of the condition, that in whatever part of the perineum the reaction first is noticed the origin is always the urethra, and that wide surgical drainage as early as possible is always indicated. If drainage is done within the first twelve or twenty-four hours the prognosis is favorable.

The surgical treatment is described in detail. The author advocates a median incision along the raphe and splitting of the scrotum and its contents into two equal parts without an entrance being made into the tunica vaginalis. From this basic incision other incisions are made wherever there is infection. Most operators are too timid and do not go deeply enough, being afraid of injuring the urethra, which, the author states, does no great harm. Transverse incisions give poor drainage and poor healing. Removal of the infected lardaceous fat should be done with scissors. Drainage occurs through the scrotal cleft along both sides of the penis.

The non surgical aspects of the treatment consist of the use of cardiac stimulants, urotropin, derivatives of sulfanilamide, and diuretics. The author has used anti-gangrene serum in 3 large doses of from 20 to 40 c cm on the first day and of 20 c cm each on the following two days.

The results of treatment were 7 deaths and 13 survivals. Two patients died of extension of the phlegmon, 2 of repeated hemorrhages, 2 of septicemia, and 1 of uremia. Later treatment of the urethral stricture must be carried out indefinitely.

RICHARD WARREN, M D

MISCELLANEOUS

Gordon-Taylor, G. Complicated Injuries of the Urinary Tract. *Brit J Urol*, 1940, 12, 75

Many unusual cases of injury to the urinary tract are presented with their treatment and sequelae. These cases were traumatic injuries from gunshot and shrapnel, injuries occurring during obstetrical and gynecological surgery, and injuries in cancer of the urinary tract.

The author comes to the following conclusions:

The enterprising surgeon is well repaid in the treatment of gunshot wounds of the urinary tract by the lives he saves. The prognosis in plurivisceral wounds is invariably determined by the associated damage to the gastro intestinal tract or to anatomical areas outside of the urinary system. Concomitant injury to neighboring bone augments the gravity of the immediate prognosis, and in cases produced by the missile of an adversary, consequent sepsis retards convalescence and renders final cure less certain.

The involvement of the thorax and abdomen in gunshot wounds became less and less feared in the War of 1914 to 1918 and the prognosis was good on the whole when solid abdominal organs such as the kidney were implicated.

The removal of portions of the urinary tract in the extirpation of cancer has been found to be associated with no forbidding mortality, and the end-results often justify this extension of the operation.

JOHN A. LOEF, M D

SURGERY OF THE BONES JOINTS MUSCLES TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Paltrinieri, M. Circumscribed Cortical Osteitis (Osteiti corticale circoscritta) *Chir. d. organo di medicina* 1940, 3: 40

In 1834 Brodie described a type of chronic bone abscess which is characteristically located in the spongy bone of the metaphyses. Since then many authors have described series of such cases, including with them cortical abscesses occurring in the diaphysis. Bernadini in 1934 pointed out some of the differences between the two types and suggested that they be classified separately. In the last few years several Italian and French authors have described cases of this circumscribed cortical osteitis. Leriche has remarked on its possible confusion with Ewing's tumor. The author believes that this cortical lesion is as common as Brodie's abscess and lists its principal characteristics as follows:

1. It is observed chiefly during childhood and adolescence.

2. The chief symptom is pain, which appears early, prevails at night, and does not always stop with immobilization.

3. The lesion has been located in the cortex in the diaphysis of long bones.

4. Radiologically it consists of a rounded focus of rarefaction with zones of circumscription and of cortical condensation; the medullary canal is not usually altered.

5. The lesion is small, often about $\frac{1}{4}$ cm. in diameter.

6. The course is chronic.

7. Upon intervention one finds pus, some small sequestra, or granulation tissue according to the phase of the disease.

8. The responsible organism in this series was always the staphylococcus.

9. Surgical exploration of the diseased segment or the opening of the focus quickly results in complete disappearance of the pain and a rapid cure.

FRANK McDOWELL, M.D.

Giberlinoni, G. The Frequency and Course of Abscesses of Bony Origin (Frequenza ed evoluzione degli ascessi osseointi) *Chir. d. organo di medicina* 1940, 3: 39

The present article is a statistical analysis of 1034 patients, representing the total number with bone and joint tuberculosis observed in the Codivilla Heberththerapy Institute between 1903 and 1938.

Of the 1034 patients, 40 per cent had neither abscesses nor fistulas, 36 per cent had abscesses, and 24 per cent had one or more fistulas without any palpable mass. About 10 per cent of those with dorsal spondylitis had radiographic evidence of mediastinal abscesses.

The patients in the third and fourth decades of life had complicating abscesses most frequently. In the chronological appearance of abscesses, the relation to the onset of the disease is as noted that they appeared very early and frequently with sacroiliac or spinal involvement, and are often the initial symptom. In the knee and upper extremity they tended to appear later.

With spondylitis, the abscesses that appeared early had a greater tendency toward resorption, while those appearing late are more prone to form fistulas. This observation is of prognostic value.

The fistulas originating from tuberculosis of the knee foot and sacroiliac regions are cured more often than those in other locations.

About 5 per cent of the abscesses regressed following puncture evacuation and similar number regressed without this procedure. Some 5 per cent formed fistulas following this form of treatment. The lesions associated with spondylitis had a lesser tendency to be reabsorbed spontaneously, while those about the knee most often responded favorably to evacuation without the formation of fistula.

Approximately 7 per cent of the abscesses had draining fistulas when the patient entered the Institute, which persisted indefinitely. Lesions of the feet were preponderant in this respect.

FRANK McDOWELL, M.D.

Pollock, A. Certain Elementary Histological Mechanisms that Take Part in the Repair of Bone (Sur quelques mécanismes histologiques fondamentaux intervenant dans la réparation osseuse) *French med. Rev.* 1940, 43: 409.

Pollock notes that more attention has been paid to the process of bone formation than to the process of construction by which the bone tissue is built into a coordinated structure. Bone is made up of fibrous stroma and calcareous-protein substance laid down in this stroma. From the point of view of mechanics the latter substance resists pressure, and the fibrous stroma resists tension. The fibrous stroma, however, plays the leading rôle in modifying the extension of bone in the process of formation and the direction in which this extension takes place.

In fractures that are well immobilized without displacement of the fragments, there is at first fibrous deposit between the ends of the fragment formed by blood and exudate from the fractured bone. By the third or the fourth day filaments of fibrin extend from one fragment to the other like bridges; these filaments become connective-tissue fibers which unite the fragments (the connective-tissue callus). On this framework the bone substance is laid down, which ultimately forms the true callus and repairs the fracture. The formation of the true callus depends upon the anatomical formation of good connective-tissue callus. In fractures that are

poorly reduced with displacement of the fragments, or in which there is considerable loss of substance, the connective-tissue fibers cannot easily form a bridge between the two fragments. Under the influence of many local factors, these fibers extend in many different directions. The effect of tension is of the greatest importance in determining the direction of these fibers. If the mass of the fibers is parallel to the axis of the fractured bone, conditions are favorable for the formation of satisfactory bony callus. If the fibers are perpendicular to the axis of the bone, new bone tissue may be formed, but it does not satisfactorily unite the two fragments, and pseudarthrosis results.

Clinical experience has demonstrated the advantage of traction in bringing about satisfactory callus formation and repair of fractures. However, this cannot be explained by any simple mechanical theory. In the biological process of bone formation and construction, many factors are involved: the conditions existing at the time the formation of fibers began, the effect of tension on the extending blood vessels, the effect of tension due to functional activity (action of muscles), and the condition of the surrounding tissues. It is these factors that demand further investigation before the process of bone repair can be thoroughly understood. ALICE M. MEYERS

Larghero-Ybarz, P. The Pathogenesis of Bi-Epiphyseal Hydatid Disease of the Joints (Patogenia de la hidatidosis bi epifisaria de las articulaciones) *Bol Soc de ciruj de Montevideo*, 1939, 10 323

The invasion of both epiphyses of a joint by the echinococcus has been noted in several instances. Ivanissevich recently summarized the literature and his own investigations of this condition. He stated that it is certain that the echinococcus can spread from one epiphysis to the other of an articulation. The di-articular cartilage constitutes, by its structure and absence of vessels, a barrier which is not penetrable unless it has been damaged. It can be atrophied and destroyed, in which case the synovial cavity may be occupied by hydatid elements. Therefore, in cases of bi-epiphyseal disease the opposite cartilage should also be damaged or destroyed, but such a process has never been observed. Conversely, it is not rare to observe cases in which the synovial cavity and cartilages are intact and the articular serosa is clean, but both epiphyses present massive infiltration. The periarthritic ligaments could be the route of propagation of the infection, but their hydatid lesions are usually of the macrovesicular type and are separated from the microvesicular lesions of the epiphysis by intact cortical bone. The connecting pathway is therefore unknown.

The author studied 2 cases of bi-epiphyseal hydatid disease of the knee with the aid of frontal and sagittal sections, and concluded that the crucial ligaments furnished the route of propagation in each instance.

FRANK McDOWELL, M D

Santaneli, L., and Poggi, A. Polycystic Meniscus of the Patella (Menisco poliquístico de la rodilla) *Bol Soc de ciruj de Rosario*, 1940, 7 41

Bibliographic references to polycystic menisci of the patella are very scanty. Trauma is recorded in approximately 45 per cent of the cases. Being more exposed, the external meniscus is more frequently injured than the internal meniscus. The differential diagnosis should consider a hernia of the articular synovia, expansion of the serous bursa of the biceps muscle, fibroma, chondroma, capsular lipoma, and articular tumors with various characteristics. The treatment method of choice is extirpation of the injured meniscus.

The author describes in detail an injury of the external meniscus in a twenty-five year-old man. Repeated traumas were given by the patient as the cause of the condition. He consulted the author on account of an impaired gait and pain in the involved extremity. Roentgenograms revealed an absence of osseous lesions. The injured meniscus was removed under spinal anesthesia through a transverse incision. A functional recovery promptly followed the operation. The histopathological examination revealed polycystic cartilage.

JOSEPH K. NARAT, M D

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC

Froehlich, M F., and Vassilaros, M. Follow-Ups on Cases of Late Intervention in Acute Osteomyelitis of the Radius in the Growth Period (Résultats éloignés d'interventions retardées pour ostéomyélite aiguë du radius en période de croissance) *Lyon chir*, 1939-1940, 36 675

The authors report 2 cases of osteomyelitis of the radius in youth, which were accompanied by loss of substance of the bone and radial deviation of the hand. One was observed forty-four years after its onset at the age of sixty, and the other, found in a patient aged eleven, was treated by the authors from the beginning over a total recorded observation



Fig 1 Deficient regeneration of the radius

period of nine months. In the latter case the deformity as corrected by traction for three months and recurrence is being prevented by a brace to be worn throughout the growth period.

RICHARD WARRER, M.D.

Benedetti Valentini, F.: The Treatment of Suppurative Lesions of the Joints, with Particular Reference to the Initial Form (Il trattamento delle suppurazioni articolari con particolare riguardo alle forme iniziali). *Policlinico* Roma, 240, 47 sec. chir. 4, 8.

In the treatment of articular infections, certain anatomical considerations require emphasis. The capsule is a closed space like the peritoneal cavity lined by synovial and cartilaginous tissue. The cartilaginous fractions are hardly affected by the presence of an infectious process and serve to cushion the underlying bony structures. The synovial membrane on the other hand, responds readily to the presence of bacterial toxins by the production of serous exudate rich in antibodies, and in the first phases of the inflammatory process acts as a barrier, impermeable alike to the organisms passing outward and to the leucocytes traveling inward to the site of invasion. Later the endothelial permeability undergoes alterations, and the synovial fluid becomes rich in protein material and leucocytes. In this manner the situation knows as articular empyema or acute purulent synovitis develops.

Based on his therapy upon these considerations the author treated 5 cases of acute arthritis of the knee joint with bilateral incisions, careful cleansing of the cavity bilateral closure of the synovial layers with instillation of 0.5 cc. of colloidal silver and closure of the postsynovial layers with catgut sutures. The skin and subcutaneous tissues were not closed. The limb was then dressed and placed in a cast from hip to ankle, provided with windows for the observation of the wounds. In these 5 cases, cultures showed staphylococci in 3 cases, streptococci in 1 mixture of staphylococci and bacilli resembling colon bacilli in 1. In the fifth case no organisms were found. All 5 subjects recovered complete use of the affected leg, although the duration of the process before treatment could be instituted varied from two to ten days.

The author reports 4 cases of acute suppurative processes observed by him during the past four years. Of these 30 involved the knee. The ratio of males to females was 3 and the second decade appeared to be the interval of highest frequency. With regard to the pathogenesis, 33 per cent occurred as a result of penetrating wounds, 24 per cent as a complication of cuts or osteomyelitis or other neighboring septic process, 9.5 per cent were secondary to remote foci, and 33 per cent were secondary to constitutional infection or to undetermined causes. The mortality in the first group was 7 per cent and in the second, 50 per cent in the other two groups the mortality rate was considered less significant because of the rôle played by general factors. The diagnosis was

made on the basis of pain, limitation of movement, elevation of temperature, and objectivity by the exquisite tenderness to palpation, evidence of fluid, and the limitation of pain on active and passive motion. Confirmatory evidence is obtained by aspiration. The importance of accurate diagnosis lies in the differentiation of the early limited form from the process which has already extended to the periarticular tissues, (authoritatively described by May).

Therapy according to the author rests upon its well founded principles: (1) that of immobilization, and (2) that of early drainage. He points out that the joint capsule, far from being a glass receptacle easily sterilized, is a cavity lined by a delicate membrane readily damaged by strong antiseptics. While acknowledging the value of the opinion held by Williams and others who advocate immediate mobilization of the affected joints in the hope of preventing fibrosis and ankylosis, the author believes that the best results are obtained by prompt evacuation of the cavity with subsequent rest, and contrasts the satisfactory results obtained by this method with the higher morbidity and mortality in the 4 cases treated by other methods. EDWIN FARNS, D.M.D.

FRACTURES AND DISLOCATIONS

Reynolds, J. T., Zeiss, C. R., and Cabbins, W. R.: Compound Fractures. *Arch. Surg.* 1919, 20, 444.

The specific aim of this analysis is to investigate the incidence of wound infection in compound fractures in two groups of cases. One group is treated by thorough sharp debridement followed if necessary by cleansing of the interior of the wound with copious floodings of bland solutions, such as saline solution or soft soap U.S.P. (green soap) followed by saline solution. For the second group almost the same routine was utilized, the difference being that iodine and alcohol were introduced into the depth of the wound after it had been debrided, before closure and sometimes before debridement. A study of 3 conservative cases of compound fractures is made.

The authors emphasize that in all cases are similar and that even in a relatively large group, such as this one, there are enough varied factors almost to nullify the value of comparison of the therapeutic methods. There are rarely two cases in the same region of bone with equal amount of comminution, equal amounts of contamination, and an equal amount of damage to the blood supply. The final outcome is also influenced by such factors as the age and general health of the patient and his ability to withstand the shock of the accident. The last-mentioned factor is rarely adequate in the average patient who presents himself for care at the Cook County Hospital. A large percentage of the high death rate in 3 cases, is accounted for by the poor general condition of the patients admitted to the Cook County Hospital and the delay in admittance following fractures. A summary of the causes of death is presented.

No uniformity of immobilization was followed. Buck's extension, skeletal traction with Steinmann nails, and plaster casts were employed. The authors' opinions vary from those who would recommend sewing the débrided wound layer by layer, tightly, as a clean wound, and those who would recommend irrigation of the open wound with a chlorinated solution designed to dissolve dead tissue, to those who would pack the débrided wound wide open with petrolatum gauze and allow the pack to be extruded from the base of the sound by the advancing walls of granulation tissue. Such diversity of opinion not only indicates the lack of an entirely satisfactory method, but emphasizes that whatever the method is, it is good in the hands of those who are familiar with its technique.

A wound which can be débrided properly is a wound which has been seen as contaminated but not yet infected. Careful excision of all contused tissue and removal of foreign material are done, the aim being to convert the area into a clean surgical wound. However, once contamination has occurred, it is doubtful that any débridement, however careful, can be ideal. One must picture a few lurking organisms in the depths of the wound. Nevertheless, the body tissues are in direct contact with the center of the wound, the tissue juices can pour into this area, and in the absence of necrotic tissue the local defensive mechanisms may attack these organisms and then allow normal healing of the wound to occur.

The authors base their avoidance of powerful antiseptics in the depths of the wound on a fact of comparative anatomy. In man the skin is able to withstand external trauma and has taken over the ordinary protective functions of the rest of the body. As would be expected, the underlying tissues, relieved of the necessity of protecting themselves from external violence, have diminished powers of self preservation and hence cannot tolerate contact with powerful antiseptics which do not harm the skin. Picture, then, a wound after careful débridement to which one has added application of iodine and alcohol. Alcohol is an excellent tissue coagulant, and this mixture of iodine and alcohol lines the wound with a layer of coagulated tissue proteins. Adding iodine and alcohol does not sterilize the interior of the wound, it injures the walls of the wound, and the bodily defenses now have to handle the layer of dead cells lining the cavity as well as to attack the organisms in the wound. The organisms, on the other hand, find themselves protected from the bodily defenses by the coagulated tissue and have time to gain a foothold. Such an apparently slight factor may decide whether the wound will remain clean.

An analysis of 88 cases is presented, in which after débridement half of the wounds were flooded with iodine and alcohol before cleansing and in the other half bland solutions as saline and U S P green soap followed by saline solution were used. Infection developed in 18.1 per cent of the patients whose

wounds were treated with iodine and alcohol, and 13.1 per cent of the patients whose wounds were treated without iodine and alcohol. The evidence that there is a greater percentage of infected wounds in those cases in which iodine and alcohol is used is explained on the assumption that the use of iodine results in the death of a sufficient number of cells to encourage infection.

ROBERT P. MONTGOMERY, M.D.

Sherman, W. O'N. The Treatment of Compound Fractures. *Arch. Surg.*, 1940, 40: 838.

First aid in treating compound fractures should be directed toward reduction of the fracture by traction, protection of the wound with sterile gauze, and splinting with plaster, steel, or wooden splints. On the patient's admission to the hospital, anteroposterior and lateral roentgenograms are made.

At operation sterile gauze is placed in the wound and the surrounding skin is shaved and thoroughly cleansed with soap and water, ether or benzine. The gauze is then removed from the wound and an adequate débridement of the devitalized skin, fascia, muscle, and detached bone is made. The débridement is of the greatest importance and should be done thoroughly. Wounds compounded from within are usually not as severe as those produced from without, nor is the contamination as great. The fracture is then reduced and immobilized by a splint, and the Carrel method of treatment of the wound is instituted at once.

Reduction of the fracture should be attempted by manipulation and manual traction followed by external fixation, preferably plaster. If internal fixation with plates and screws is used, a Thomas, Jones, or Cabot splint gives complete satisfaction in selected cases. Molded rather than circular plaster casts should be used, unless the latter are split within twelve hours, because of the possibility of complications due to constriction or gangrene. Repeated inspections should be made, and at the first sign of circulatory disturbance the splints should be released.

Should the reduction not be satisfactory an open reduction can be done after the local swelling has subsided and the temperature and pulse have become normal, which is usually at the end of ten or twelve days. The operative incision for fixation of the fracture with plate or screw is made, not at the site of the original compound wound, but at a point opposite, so as not to contaminate this particular field with the operative incision. The compound wound is permitted to granulate and is usually cicatrized before bony union has taken place. However, should a small sinus persist, the plates and screws are removed and the wound is closed.

A wound compounded from without should be treated as potentially infected, thorough débridement being performed at the earliest possible moment. The wound should remain open, and Carrel tubes should be inserted to every cavity and recess. Immediately after the operation the wound should

be copiously irrigated through Carrel tubes. Ith solution of sodium hypochlorite. At the end of 1 or three days the dressings are changed and new tubes inserted.

Steel plates and screws are usually employed for transverse fractures and transfixion screws for oblique fractures. Extensively comminuted fractures do not usually lend themselves to fixation by screws and plates and should be treated by skeletal traction, preferably with Kirschner wire. This wire can be incorporated in the cast in selected cases, but is not used routinely by the author because the introduction of pins or wires above and below the site of fracture increases the possibilities of complications arising from the use of this technique. Unless débridement and the Carrel wound sterilization are done thoroughly plates and screws should not be used, as they tend to complicate the massive osteomyelitis which frequently results from infection. As a rule if plates and screws are used, the wound should be left open. It is admitted that in some cases in which there is little or no swelling or trauma to the soft parts, closure of the wound can be done after internal metallic fixation, but such treatment should be undertaken only by surgeons of wide experience and sound judgment. If the slightest evidence of infection becomes manifest, the wound should be widely opened, plates and screws should be exposed but not removed, and the Carrel method should be instituted after one is sure that the tubes have been inserted in every pocket or recess. It is extremely hazardous to use metal fixation in compound fractures unless the wound has been carefully debrided and the Carrel treatment instituted immediately.

If vanadium steel is used in the treatment of compound fractures, 60 per cent of the plates and screws must be removed. The author usually removes the plates and screws if the wound is unhealed in from five to seven weeks after their insertion. A new stainless steel (chrome, 8 per cent, nickel, 8 per cent molybdenum, 38 per cent Rockwell hardness, C scale, 35 to 37) has been recommended in place of vanadium steel. It has all the physical properties of vanadium steel and will not corrode in the presence of sodium chloride or sodium hypochlorite solutions. It is much superior in physical properties to titanium, which is objectionable because it is cast metal, is entirely too brittle, and contains air bubbles. This new alloy steel is the solution to the question of the use of metals when screws, plates, nails, and other metal fixative devices are used. They can be used over again. Metals such as monel and duralumin should not be used because of the tendency of the copper in the monel metal to corrode and because duralumin has a tendency to corrode and effloresce in the presence of saline solution. Electrolysis does not occur when like metals are used.

A concentrated solution of sodium hypochlorite (4.05 per cent) and sodium chloride (3.25 per cent) (hypochlorite N.N.R.) of a low alkalinity pH is used

in the Carrel technique. This solution is relatively stable, losing about 1 per cent of its active chlorine per year. The addition of 6 1/2 parts of 100 parts of the concentrate makes a solution of proper strength as to both sodium hypochlorite and sodium chloride content and is vastly superior to solutions made from sodium hypochlorite or liquid chlorine. The commonly used term chlorinated soda does not sufficiently specify the real quality or content of sodium hypochlorite. This concentrate has been diluted 4 1/2 to 1 is hypertonic it greatly increases the osmotic action and the flow of phagocytes and lymphocytes into the wound, and there is no danger of dehydration of the body.

A most scrupulous instrumental technique and most careful asepsis with attention to sound and generally accepted surgical principles must be adhered to if success is to be assured. The principles are simple and can be easily executed by surgeons and nurses who have received instructions, have an understanding, and who are intent on carrying out the technique without alteration.

The author states that a visit by him to the clinic of DePage at LaPanne, Belgium disclosed 80 patients with compound fractures undergoing treatment without a single infected wound. Sepsis and infection of wounds were completely controlled in injuries treated within the first six to eight hours. Visits to every other hospital, except for three where the Carrel method was carried out, revealed infection in every compound fracture treated between May and November 1916.

The author's statistics in 1,197 cases showed amputations of 5 legs, due to the loss of the soft parts, 1 to infection, and 3 to thrombosis and secondary hemorrhage with extensive destruction and crushing of the bone and soft parts. Eighteen amputations of the phalanges were done because of destruction of the blood supply and loss of the soft parts. There were no cases of sepsis and only 3 deaths, one from an embolus a few days following hospitalization and the other from shock following reconstruction operation.

The results secured are ample evidence of the soundness of the principles employed. The author is not in accord with the methods being advocated in Europe, including the use of non-padded plaster, and the closed technique in treating compound fractures. He fully realizes that such methods may be necessary as war emergency. However he advocates that when time and environment permit, accurate reduction of the fracture, débridement and the Carrel technique with immobilization, either by plates or by splints, is the best procedure and is certain to bring about the best functional results in the shortest period, with a minimum of sepsis, amputations, and deaths.

Non-union is a more frequent complication in compound fractures than in simple fractures, but it is important that it be differentiated from delayed union. Application of an autogenous bone graft, either inlay or onlay is usually the treatment of

choice. The graft should be firmly affixed to the host and immobilized by transfixion with two or four stainless steel (chrome nickel-molybdenum) screws. After operation, plaster splints completely immobilizing the fracture should be used until union occurs. The Morton Smart technique of graduated contraction of muscle should be instituted as soon as union takes place, as it not only restores muscle tone rapidly but increases the circulation to the extremity. If postoperative infection occurs, the wound should be opened widely and Carrel tubes inserted into every recess and cavity, the hypochlorite solution being injected every two hours until the wound is free from gross infection. If osteomyelitis or other infection has complicated the healing of a compound fracture, resulting in non-union, the bonegrafting operation should be delayed from six to twelve months. Repeated bone grafts, two and sometimes three, are necessary in these cases before strong bony union is secured. The prolonged convalescence could have been materially reduced had the initial treatment of débridement, immobilization, and the Carrel method been instituted.

ROBERT P. MONTGOMERY, M.D.

Orr, H. W. *The Treatment of Compound Fractures, with Special Reference to Military Surgical Procedures*. *Arch Surg*, 1940, 40: 825

Any method of treatment for compound fractures to be most effectual must not neglect the absolutely essential fundamentals of immediate reduction of the fracture, drainage for infected wounds, immobilization in correct position, and control during repair of the fracture. Restoration of the circulation and nerve supply, and provision for rest to favor physiological function in injured and inflamed parts must not be neglected as they were in the World War.

The author repeats a program as proposed by him in 1923 as follows:

- 1 Prior to any operation in a case of chronic osteomyelitis or of compound fracture, immobilize the patient on a traction table with all of the injured parts as nearly as possible in correct anatomical position. Reduce the fractures at once, especially by efficient traction, so that the circulation and nerve supply are restored. If there is an older deformity, correct it first by traction and manipulation. Even in seriously injured patients with multiple fractures or extensive injuries to the thigh, shock may nearly always be avoided by preliminary control of the patient in this way. If a patient arrives at the hospital in shock, employ the customary medication—dextrose solution given intravenously, physiological solution of sodium chloride given hypodermically, or blood transfusion. However, do not leave him with a mangled limb unreduced and tortured by painful movements and muscle spasm. Efforts to relieve shock (shock therapy) are often futile if the local conditions that cause so much suffering are not relieved.

- 2 Open the entire infected area and drain by a suitable operation (débridement), so that foreign

material and dead or dying tissue are removed. As part of the drainage operation the wound may be wiped out with pure tincture of iodine and alcohol, as in preparation of the skin, in order to reduce the amount and virulence of the accidental infection.

- 3 To protect the surface of the wound and provide permanent drainage, fill the wound with a non-absorbent, non-irritating petrolatum pack. (This is the open wound treatment that has prevented gas-bacillus infection in so many cases.) Use no drainage tubes, and do not cover any parts of the wound by flaps, sutures, or overhanging portions of tissue. The pack must be carried to the depths of the wound and it must flow over the edges at the top to a distance of about 1 in. (2.5 cm) on the surrounding skin. This is to carry discharges away from the area just around the wound. Complete the dressing with a dry, sterile absorbent pad bandaged firmly over the drainage pack and its edges.

- 4 Enclose the entire limb in a plaster-of-Paris cast. In cases of fracture and after the correction of deformities, incorporate in the cast the moleskin adhesive plaster, ice tongs, traction pins, or pins extending directly into the fracture fragments. This makes permanent the traction and fixation obtained on the table during operation. Casts must fit well and be sufficiently extensive to overcome muscle spasm and irritative motion of all kinds once and for all.

- 5 When removal of a severely injured limb is indicated or even definitely impending, wait, if necessary, for improvement in the patient's local or general condition, but lest this waiting be unprofitable, relieve pain, shock, and infection by immobilization of the limb in correct position and by adequate drainage while other supporting measures are employed.

- 6 Finally, do no postoperative dressing. If immobilizing devices become inefficient, if discharge is profuse, or if odor (because of mixed infection) becomes unendurable, change dressings in the operating room without disturbing the parts and with a minimum of damage to the surface of the wound. Usually the original dressing may remain in place for from four to eight weeks, or even longer, until the wound has made good progress toward healing.

If such a program is to be adhered to, a number of misconceptions must be laid aside.

- 1 The misconception that primary treatment must be delayed to allow the patient to recover from shock, hemorrhage, or swelling. The fact is that all of these conditions may be prevented or relieved by immediate reduction and control of the injured parts in correct length and position. With reduction of the fracture there is restoration of the circulation and nerve supply, hence all of the physiological functions in the injured part may be expected to improve.

- 2 The misconception that every injury is an individual problem to be solved by the particular surgeon attending in each case. This is a general teach-

ing which has done much harm. Adherence to a routine calling for reduction of the fracture and control of the limb will soon convince any surgeon that there are certain rules that are applicable to every case, regardless of time, place, or circumstances.

3. The misconception that plaster of Paris cannot be used in the treatment of fractures because it implies constriction of the limb and will do harm by interfering with circulation. A properly applied plaster of Paris cast is tight enough to cause constriction of the limb or distress. A painful cast is an improperly applied cast. When a cast locking fixation pins has been applied, immobilization in correct length and position is an fait accompli. On modern traction tables, reduction of the fracture, suitable drainage dressings, and correct plaster of Paris dressing with skeletal fixation may all be effected quickly without difficulty or delay.

4. The misconception that infection must be combated by active chemical antiseptics and therefore that splints must be adjustable or removable. It is too often forgotten that when Lord Lister introduced the antiseptic method he placed his chief reliance on exclusion of infection from the wound and on the patient's resistance to overcome local and systemic infections. Lister divided repeatedly against the application of phenol and other chemicals directly to the surface of the wound. He warned us against the introduction of infection at the time of making dressings and the distribution of infection by metastasis. Frequent dressing by whatever method, violates the principle of protecting the surface of the wound and the patient against secondary infection. Even such a method as the introduction of maggots every few days subjects the patient to greater risk of mixed infection than does an irrigation or an antiseptic dressing.

5. Mechanical cleanliness of the wound is unnecessary. It is specific infection, and particularly mixed infection, that does the damage in these cases. If the patient can have his original damage and infection minimized by an adequate primary surgical procedure and if he can then be protected against irritation from movement, or sole spasm, and frequent dressings, he will usually be able to defend himself. This is true especially if correct anatomical relations and physiological function have been restored to the injured extremity.

6. The misconception that fractures cannot be reduced secondarily or deformity corrected in the presence of infected wounds. The author states that during his military service with the British Army fifty years ago he was taught that compound fractures must be soundly healed for several months before an original procedure could be attempted. Procedures to correct fractures deformities or non union and even operations on the peripheral nerves had to wait not only until healing had been obtained (often it never was obtained), but until the scarred region would withstand period of massage about lighting pipe. Now it is known that under the conditions described, that is, drainage

when necessary, anatomical reposition, perfect immobilization, and protection against infection both before and after operation, any of these operations may be done at any time. To do such operations

without delay is especially important when control of a fracture has been lost or when deformity is impending or has occurred. If this way long periods of disability and deformity are prevented. Moreover many patients will heal early with good limbs, who would go through much longer periods of healing if their deformities and other pathological conditions remained unrelieved.

The experiences of the author and other competent observers who employed these principles in 1000 cases of the late Spanish war show that good results may be obtained in from 85 to 90 per cent of compound infected fractures of all kinds by the infrequent dressing method. Leaving the wound open is a factor of importance in dealing with all the aerobic infections. That the petrolatum pack and the cast exclude oxygen from these wounds is erroneous.

The points for consideration in both civil and military practice are as simple as they are important.

For first aid on the battlefield or in the scene of the accident the use of tourniquet and traction immobilization. Thomas splint have demonstrated their value as life-saving and limb-saving expedients. Prepared in this way the patient may be transported safely to hospital where more efficient traction, débridement, petrolatum pack drainage and fixation in a plaster of Paris cast may all be done.

The same technique is to be applied whether the treatment is primary that is, applied during the first few hours, or secondary in the sense that the patient arrives with the fracture in malposition, the wound infected and septicemia and pyemia already established. A restless patient with an unreduced fracture, muscle spasm, pain, and septic wound can do himself far more harm every hour than the surgeon ill do by thirty minutes maneuver after which the compound fractured limb will be permanently immobilized in correct position, the wound adequately drained, and the surface of the wound and the limb fully protected against further trauma and infection.

ROBERT F. MONTGOMERY M.D.

Kewdar A. T. and Mitchell, C. L. Late Rupture of the Extensor Pollicis Longus Tendon Following Colles' Fracture. *J Bone & Joint Surg.* 1930, 4:29.

Several cases of spontaneous or late rupture of the extensor pollicis longus tendon, following fracture of the lower end of the radius, have been reported in the literature. The authors report details of another case.

A forty-four-year-old woman fractured her left wrist and twenty days later noted inability to extend the thumb. Five weeks later the tendon was repaired and in defect between the trapezoid and trapezium was overcome by splitting the proximal segment. This operation was successful and a month later

tendon graft was performed and an excellent result obtained

A review of 50 cases from the literature show this rupture to be more common in females, in a ratio of 6 to 4. The greatest incidence was between the ages of twenty-one and forty years. The average latent period between the time of fracture and occurrence of tendon rupture is six weeks. The symptoms and diagnoses are reviewed.

Trauma at the time of a Colles' fracture is the predisposing cause of rupture and at that time the tendon may be partially severed, or, more probably, the blood supply of the tendon is interfered with by direct injury to the vessels by pressure from hemorrhage, or by scar-tissue formation later. The direct cause of the rupture is a sudden flexion or extension of the thumb. At operation the tendon is found to be frayed and either end may be attached to the periosteum by scar tissue. In the authors' case the biopsy revealed chronic inflammatory changes in the end of the tendon with evidence of old hemorrhage.

The prognosis is good in operative cases. Spontaneous recovery of useful function of the thumb can not be expected.

The ideal treatment is end-to-end suture of the divided tendon. If the proximal segment has retracted under the dorsal carpal ligament this must be divided and the end found. The tendon is not replaced in its groove. The normal oblique course of the tendon may be attained by passing it through a fascial pulley. The authors attempted to preserve the obliquity by suturing subcutaneous fat about the tendon, but this did not hold, however, a satisfactory result was obtained.

If the proximal stump cannot be found the distal segment may be attached to other tendons to the thumb or the extensor of the wrist. When a gap exists between the stumps either lengthening of the tendon or tendon grafting is required.

HARVEY S. ALLEN, M.D.

Boehler, L. *Evolution of the Treatment and Clinical Evaluation of Vertebral Fractures* (Wandlungen in der Behandlung und Begutachtung von Wirbelbruechen). 64 Tag d. deutsch. Ges. f. Chir., Berlin, 1940.

Ever since the time of Hippocrates, attempts to reduce fractures of the vertebra have been made. The results, just as after the reduction of every type of fracture, have been good only when a sufficiently long and uninterrupted period of complete rest followed the reduction. In 1929, Davis presented the first reduced fractures of the vertebra which had healed in good position. Since 1930, Boehler has practiced reduction followed immediately by special exercises. Reduction is most successful on the first day. If the proper plaster jacket is applied immediately thereafter and left on for from three to six months, on the average for four months, the vertebral bodies which have been straightened out will no longer collapse. The results following this type of treatment are extremely good because form, mobil-

ity, and strength are usually restored. Of the patients covered by insurance, 93 per cent no longer received compensation at the end of two years. Magnus is an opponent of reduction. Of his patients, only 21 per cent no longer received compensation after two years, and after six years only 45 per cent no longer required compensation.

Boehler differentiates four types of vertebral fractures with paralysis:

1. Fractures without displacement, in which the paralysis is produced as the result of concussion, hemorrhage, or edema. This type of paralysis disappears spontaneously.

2. Fractures with severe dislocation in which the vertebral arch is retained. In these cases the spinal cord has been severed by compression. Reduction is therefore hopeless.

3. Dislocation fractures with unilateral or bilateral fracture of the arch in the interarticular portion. In these cases the spinal cord is only compressed but not severed, because the vertebral arch has become widened. It is only these cases that should be reduced by the closed method, and then only after preceding light longitudinal traction on the arms and legs in the dorsal plane. The prognosis or cure in these cases is extremely good.

4. Dislocation fractures with comparatively slight displacement and with impaction of the articular processes. In these cases, also, the spinal cord is usually spared. They permit of reduction in the dorsal plane after preceding partial resection of the articular processes.

In the discussion LEHMANN reported his experiences with the Boehler treatment of vertebral fractures. He believes that comparison of the functional method (Loehcker and Magnus) with the treatment of Boehler is not proper, as the method of Boehler (by means of the application of a plaster corset) is indeed also a functional method. To be sure, this corset at once passively fixes the lordotic posture. On the other hand, however, if this plaster corset is constructed in the manner in which it usually is done at the Rostock Clinic (the axillae are allowed to remain free while the anterior sternal portion of the corset lying firmly upon the sternum is carried on up to the level of the jugular veins, which causes the broad anterior projection of the plaster corset to act as a monitory handage), the lordotic posture is further aided by active muscular exertion, if the injured person would avoid unpleasant pressure upon the neck. In addition to this, the patients, after having been fitted with plaster corsets which have become firmly fixed, are immediately sent to playgrounds and to gymnasiums where they take part in boxing, javelin throwing, and football. As for the actual exhibit, Lehmann showed a film which demonstrated that, for the purpose of correcting the usual type of wedge shaped vertebra into any form of lordosis, the simple suspension sling or the pulling up of either the upper part of the body or the legs suffices. This form of treatment, however, is insufficient in the luxation fractures associated

with injuries of the posterior surface of the vertebral bodies and anterior displacement of one of the fragments in the direction of the spinal canal. In these cases, if an attempt were made to straighten out the injured posterior margin of the vertebra by means of suspension, the compression would be still further increased and the fragment would be driven into the vertebral canal. It was shown, by means of the model exhibit, that this danger could easily be avoided by employing extension (Gimson sling at the head and extension traction on both legs) before using the suspension sling. Up to the present time Lehmann has encountered no complications during the process of reduction. He regards it as possible that his success is to be attributed to the method used.

He reported 30 cases. In one-half of those which were reduced the original result was not retained as the vertebrae collapsed, pain however in none of the cases were the resulting conditions worse than those found at the time of admission. In 25 of the cases reduction was unsuccessful either because associated injuries were present or because there was great delay before treatment was instituted. In some cases the treatment by means of the plaster corset had to be abandoned after a short trial because of circulatory disturbances (coronary sclerosis).

In those cases in which the spinal cord was also involved reduction was undertaken. If the paralytic phenomena persisted the patients were placed on plaster bed, which produces better fixation than the Rauchwies suspension sling. All the patients in whom reduction was successful and could be retained had functionally good results, i. e. they were free from pain and able to move. Of the patients in whom, after the initial reduction, the vertebrae again collapsed, only one-half had good results the remainder showed limitation of motion. However the results were also remarkably good in the cases in which reduction was unsuccessful, which shows that not in all cases does good function and freedom from pain depend entirely upon the successful anatomical restitution of the injured vertebrae.

It should not be forgotten however that the patients whose vertebrae heal in poor position suffer with spondylopathia deformans later even though they may not have any complaints at first. The relationship between the symptoms resulting from the latter and the original accident can no longer be denied. The reproach which Erlich recently expressed, and which to-day was also expressed by Buerkle de la Camp, against the Boehler plaster corset treatment—that it has psychically and worse effect upon the injured patient—cannot be shared by Lehmann. At any rate, the injured were not treated with the plaster corset longer than from eight to ten weeks at the Rostock Clinic, and not for one half year as Buerkle de la Camp asserts. Lehmann believes that he can manage the treatment by means of the plaster corset. The previous experiences with the Boehler method of reducing the fractured vertebrae

and the institution of active exercises in the plaster corset encourage Lehmann to continue further in the same manner.

BICKER, who in 1938 wrote in favor of the Boehler method of treatment of vertebral fractures on the basis of 6 cases of his own (*Menschen und Maschinen*) reports 1 failure. The case was a compression fracture of the first lumbar vertebra, sustained as the patient was struck in the back by a locomotive. By means of ventral suspension there was complete reduction of the compressed vertebra to the point of gaping of the fracture line. In spite of the fact that a window was made in the back of the plaster bed, decubitus developed, which led to death in four weeks. Attention was called to the importance of this back window which can be widened extensively without endangering the plaster bed.

I. G. J. SOMMER had undertaken the method of treatment recommended by von Brunn and Magnus in Dortmund, because this method, as described by Magnus, seemed to him to have been given sufficient trial and was completely satisfactory for the treatment of the accident cases occurring in the Ruhr coal region. Among 98 cases of definitely proved cup and wedge fractures of the thoracic and lumbar spines, 2 with an associated paralysis of the bladder, rectum, and both lower limbs were reduced. All of these patients died within a period of from fifteen to five hundred days as a result of pyelonephritis. The remaining 96 patients in whom the fractures were not reduced were able to return to work again after an average period of treatment of one hundred and twenty too days one-third of these were engaged in heavy mining activity another third were engaged in moderately heavy work, and the last third were engaged in light work. After two years 50 per cent were receiving compensation, and after four years none was still receiving compensation. Especially when the ability to work and the economy of materials are the demands of the hour, does the method of von Brunn and Magnus seem to Sommer to have all the advantages as far as his own particular group of patients is concerned.

VON DAMMELEMAN reports repeatedly concerning vertebral fractures resulting from the effects of mild external forces. These fractures are not particularly rare. In one year 4 related observations were made: vertebral fracture resulting from the slipping of heavy table, from the patient's slipping on the horse floor, from the patient's partaking in trotting race, and from small jump without a fall, executed by beginner sking. A fracture of transverse process occurred in the attempt to place the heel on the shoulder. These fractures occurred because of failure of proper muscular regulation resulting from surprise or insufficient practice (beginners in sports). The body masses set in motion by external stimuli furnished the destructive force. A disregard of these circumstances in one case led to a lengthy and expensive compensation.

Up until the present time basic and continuous researches concerning the healing of injuries of the

spinal column, especially of vertebral fractures, have been reported by LOB. The researches were made by means of animal experimentation. As far as the conditions in man are concerned, entirely too much dependence has been placed upon parallels drawn to the healing of fractures of the long bones. The circumstances in injuries of the spinal column are quite different from those existing in injuries of the long bones. The examination of a large number of spinal-column preparations taken at every period of the healing process and from all forms of fractures has shown us that very special circumstances exist in the course of healing of even the ordinary type of vertebral fracture. It has been possible to demonstrate that the simple fracture resulting from a compressing impact is accompanied by an impaction of the spongiosa system which provides favorable conditions for weight-bearing ability and for later healing. Since the formation of callus of periosteal and endosteal character is very slight and takes place comparatively slowly, every attempt to loosen the impaction would endanger the conditions necessary for healing. Goecke has shown that the weight-bearing ability of the impacted type of fracture is surprisingly good. This changes, however, just as soon as the impaction has been dissolved and the spongiosa portion of the fragments has been pulled asunder. LOB was able to show in animal experiments that defects in the vertebral bodies do not heal at all because, even in animals, the endosteal and periosteal callus formation is a comparatively light one. He states that when we consider the fact that even in a simple impaction fracture, there exist special conditions, we can realize that this is true particularly in those forms of fracture in which, because of the wedge like action of the ligamentous attachments of the Gallert nucleus, which becomes prolapsed into the fracture cleft, special difficulties arise. The prolapsed ligamentous attachments of the intervertebral discs are not replaceable, this we have been able to see in our studies of preparations of the human spinal column. This tissue remains lying in the tears and clefts or else in the depressions resulting from the fracture, and produces exactly the same conditions as does the interposition of soft tissues in the case of fractures of the long bones. The tissue which has become prolapsed into the body of the vertebra itself further hinders the already sparse endosteal callus formation and produces pictures similar to those one sees in a tight pseudarthrosis. Even after a period of years one can still find the ligamentous attachments of the intervertebral discs, which have undergone degenerative connective tissue changes in the fracture spaces.

Since very many examinations depend entirely upon the roentgenogram and the roentgenogram is not always correctly interpreted as far as the condition of the intervertebral disc is concerned, it is no wonder that the true state of affairs frequently remains unnoticed. This is true in spite of the fact that we are dealing with an extremely important factor which in itself is capable of explaining the

poor results following the reduction of vertebral fractures and also the differences in the requisite length of time necessary for the various methods of treatment (Magnus and Boehler). For it is obvious that a fractured vertebral body, which has regained its external form and is permeated by the ligamentous tissue of the intervertebral disc, must necessarily collapse again when subjected to too early weight-bearing, especially because the fractured lateral arches and articular processes have not yet undergone bony union. The unreduced vertebral fracture, on the other hand, has a poorer position, but, nevertheless, there are static conditions which from the very beginning are more amenable to the assumption of weight-bearing without further collapse.

Especially interesting is the case of Wachs which was reviewed by Boehler in support of his own views. This case was that of a reduced vertebral fracture in which the prolapse of intervertebral-disc tissue into the inner portion of the vertebral body could be plainly seen. In spite of the fact that the posterior wedge fragment still encroached upon the spinal canal as the reduction had in no way altered this condition, this vertebral fracture is by no means to be designated as healed. The histological preparation plainly showed nuclear tissue in the fracture spaces but did not show any firm bony union of the fracture fragments. This case, therefore, is a proof of the correctness of the point of view, that in spite of the reduction, the intervertebral disc tissue remains lying in the fracture spaces, and later on when the vertebra is subjected to weight-bearing, a collapse of the vertebral body may be expected. Since the injured person in this case was paralyzed, it was impossible to obtain counterproof to this assertion, that the vertebral body had been able to withstand later weight-bearing. From this point of view also, therefore, the case of Wachs cannot be used to prove the validity of Boehler's argument. The spur formations and projections which were previously regarded as periosteal-callus bridges occur only, as has been proved, in those cases in which the intervertebral disc tissue has prolapsed either laterally or anteriorly. Therefore in these cases we are dealing, not with evidences of healing of the actual vertebral fracture, but rather with a bony metamorphosis of the prolapsed intervertebral-disc tissue, i.e., with evidences of healing of the intervertebral disc itself. These assertions were further elucidated by numerous pictures.

MAGNUS emphasizes the fact that in these cases we are dealing with two completely different indications, paralysis and correction of the gibbus. Among the causes of the paraplegias, Boehler has left one unmentioned, namely, the hemorrhage from the site of the fracture into the vertebral canal, which leads to a compression of the spinal cord. This transverse paralysis may frequently be recognized by the fact that it first makes its appearance after the patient has been admitted to the clinic. It most certainly recedes independently of the type of treatment.

There are even paraplegias which recede spontaneously. Magnus referred to a previous series of 55 cases, of which 3 healed completely and 3 healed with only minor remnants of the previous paralysis. In his clinic at Munich, in addition to cases of transverse paralysis which receded spontaneously, he reduced cases of paraplegia according to the accepted manner, but in spite of this, none of these was remarkably improved. Magnus then showed a table in which the purely functionally treated cases were compared with those who had been treated elsewhere by the old method and had worn corsets. In the latter group the time of hospitalization and the amount of compensation paid was almost double that of the former. Further attention is called to the fact that the amount of compensation paid decreases rather rapidly in the cases treated functionally, whereas in the cases in which corsets are worn the amount of compensation remains high (corset cripples).

From the table of Boehler it is shown that the period of treatment is at first from four to eight weeks and finally from four to six months, and to-day mention is made of eleven months. This represents a heavy burden for the corset wearers. In contrast to this, the functionally treated patients returned to work after a period of six months, a period of treatment similar in length to that mentioned by Sommer.

Another table taken from the statistical review of Haumann, reveals facts relative to the compensation question. It is certainly not true that those who have residual gibbous receive a particularly high compensation. Age, fragility, lack of cooperation and even intent to defraud all play a part. Formerly Magnus assumed that vertebral fractures treated by the functional method did not tend to collapse later. Today he no longer maintains this view point, however the cases in which collapse occurs are quite rare. The reduced cases may also collapse later and indeed, in apparently larger numbers Magnus does not regard it as surprising that two different methods exist for the treatment of vertebral fractures. However he believes that the method of treatment of Loebke and Brunn, even after today, arguments of Boerile-de-la-Camp and Sommer is still the proper method for the workers of the industrial region.

HAUMANN states that they have reduced fractures of the vertebra of pronounced wedge-like form according to the method of Boehler but, on the other hand, they have abstained from the reduction of mild vertebral fractures. The reduction of those fractures of the vertebra which have a marked wedge-like form yields very good results in the lumbar and lower thoracic regions. However the rigid vertebral body frequently shows a poor tendency to heal. When the plaster cast is removed in these cases considerable evidence of injury still remains. Among the most important findings are (1) reduced weight-bearing ability of the spinal column, (2) complaints of subjective nature and

(3) poor mobility of the spinal column. Haumann believes the fractured and, as a result of the reduction, the pulled-apart spongy bone evident does not always possess the requirements for healing. The most favorable healing conditions in fractured spongy bones in general is well known, but in the spinal column these conditions are even particularly unfavorable. In mild vertebral fractures the endosteal and periosteal bone formation, which in itself is rather poor, suffices for the achievement of healing. On the other hand, in the badly compressed fractures which have been pulled apart, the result of reduction, this bone-forming activity does not always suffice to produce solid healing of the vertebral bodies. Further complicating factors are represented by the relationship of the intervertebral disc and the nucleus pulposus. These conditions explain the fact that treatment by means of the plaster bed frequently has to be extended beyond a period of five, six, or even seven months. The disability is therefore greatly decreased as the result.

Decreased weight-bearing ability and limited mobility of the spinal column. These conditions also explain the matter of the subjective complaints which often make it difficult for the sufferer to ascertain himself the process of working. Much better results are obtained when similar types of fracture are treated by the functional method. The compressed vertebral body retains its wedge shape. This fact is very frequently to great advantage because as a result of this the vertebral body can bear firmly. To be sure the direction of the axis is disturbed, the site of the fracture, but the weight-bearing ability of the spinal column and its function on the other hand, are for the most part restored. Although it is true that with the Boehler method of reduction the direction of the axis, the site of the fracture is restored, nevertheless the weight-bearing ability and the function of the spinal column are often extensively disturbed. Therefore, the ability of the functionally treated patient to work, return much earlier and his readjustment to the industrial process creates no difficulties. The nervous injuries, as far as the spinal cord is concerned, are but too means as favorably influenced by the reduction. Indeed many times they are made over, just as have been heard from Boerile-de-la-Camp.

The injuries to the spinal cord are frequently caused by the posterior superior quadrant of the vertebral body and by a fragment of bone which has become separated in this region (shearing fracture). Because of the fact that the anterior portion of the vertebral body is crushed together by the result of the fracturing force, a bone fragment becomes detached from the upper posterior quadrant. It happens, therefore, that this bone fragment is not displaced into the vertebral canal, but is reduced according to Boehler's method is undertaken but is immediately driven into the spinal canal at the time of the surgery. Haumann has frequently seen this phenomenon in the top. It is of the opinion that the separated bone fragment is displaced into

(3) reduced weight-bearing ability of the spinal column, (2) complaints of subjective nature and

further into the vertebral canal during the course of reduction. Although the occurrence of cord injuries, caused by the separation of the bone fragment from the posterior superior quadrant of the vertebral body, is not rare but rather characteristic, nevertheless, the observation (which is described in Haumann's book entitled "Vertebral Fractures and their Results") of a case in which the separated bone fragment of the inferior posterior quadrant had become displaced into the spinal canal is of the greatest rarity.

Paraplegias, the origin of which may be attributed to hemorrhages into the spinal canal, may recede quite extensively following the functional form of treatment just as well as after the employment of Boehler's reduction method of treatment. As to the problem of the reduction method of Boehler, the chief concern is with the cardinal question: Does the reduced vertebral body always regain sufficient firmness? This question cannot always be answered in the affirmative on the basis of the clinical experiences. On the other hand, it is not a matter of question but rather a fact, established through decades of experience and confirmed by numerous autopsies, that the wedge-shaped, compressed vertebral body insures an ivory-hard permanent healing. It is our duty to restore our patients and to return them again to work by means of the best, most certain, and quickest possible method. With the material at our disposal we have been able to accomplish this, not by means of the Boehler method, but rather by means of the functional method of treatment.

JOERG can make no comments as far as the purely specialized surgical arguments are concerned. He gives a report simply about his personal experiences, which he underwent as a patient treated by the Boehler method, as well as observations that he had made with 12 other patients treated by this method. He himself had sustained a compression fracture of the third lumbar vertebra during a forced landing with a pursuit plane in enemy territory during the Polish expedition. Following this he had to go on foot across the Carpathian mountains for two days and two nights, and it was twelve days after the accident when he came into Boehler's hands. He was treated by immediate reduction in ventral suspension, by which the gibbus was corrected and the physiological lordosis was increased. A plaster cast was applied. Immediate ambulation was permitted and Boehler gymnastics were prescribed. During the so called vertebral gymnastic hour, he made the acquaintance of about a dozen patients suffering with injuries of the spine, some of whom were already carrying out their prescribed gymnastic exercises while they were still wearing their plaster casts, while others had already discarded their casts. These patients were all questioned about their conditions. Without exception they were full of praise for the treatment, and Joerg heard no complaints from a single one of them concerning the disadvantages of the Boehler method of treatment

such as those which have been mentioned in the discussion, viz., the burdensomeness of the cast, restricted mobility after its removal, relatively long duration of the illness, and psychic depression. He himself had no complaints to make. Indeed he was able, while the cast was still in place, to perform clinic service (including the performance of operations), and has had no complaints of any kind either while wearing or after removal of the plaster jacket. Further, he experienced a physical sense of well being and regarded himself as particularly fortunate in that he was permitted to get up immediately. From the point of view of the patient, Joerg at any time would again gladly trust himself to the Boehler method of treatment. (Upon request there followed several gymnastic exercises: a hand stand, touching the floor with closed fists while the legs remained completely erect. Later x-ray films of the fracture site were shown.)

At the Surgical Congress held two years previously, KOCH had reported that the Boehler method of reduction of vertebral fractures had been employed in about 100 cases of fresh vertebral fractures, occurring in miners, treated at the Bergmannsheil Hospital II, in Buer, W up until 1938. Even at that time he had asserted that this method had become the method of choice in his hospital for the treatment of certain types of fresh vertebral fractures. During the interval, i.e., up until the present time, he has reduced about 135 fresh vertebral fractures completely according to the method of Boehler, and has carried out the after treatment as prescribed by Boehler, without experiencing damage of any kind in even a single patient after reduction of the fracture by this method. In the course of the treatment, all of these patients had been subjected to a neurological examination by the neurological department. It is essential that, in carrying out the Boehler method, the directions given by Boehler are followed exactly. During the past two years the cases suitable for this method were selected with great accuracy. All of the mild fresh vertebral fractures belong in this group, hood fractures and fractures with separation of a bone fragment were not treated by this method. Also, all of the very severe cases, i.e., those cases in which an undeniable transverse injury of the spinal cord resulted from a fracture of the vertebra (occurring in miners), were not treated by the Boehler method, because experience had shown that unfortunately no favorable change in the sad condition of the patient could be obtained even by this method of reduction. All other types of fractures, those with a marked wedging of the vertebra, and those with external evidence of a marked change in the form of the spinal column, in other words, all severe wedge fractures of the lumbar and lower thoracic spine without associated injuries, were treated immediately by the Boehler method and later exactly according to the concepts of Boehler. The results were good, at any event, without failures, and, also, the rate of compensation for these injuries could later be placed at a lower

level than that for cases which are not treated by the Boehler method. In none of the cases treated by this method, were psychic disturbances observed. The Boehler method remains the method of choice of Koch for the treatment of fresh vertebral fractures occurring in miners, provided the above-described selection of cases is observed.

Further discussions are made of the social as well as of the human elements of vertebral fractures, especially those associated with transverse lesions. Here, the use of the surgical knife has no place. However the employment of many other types of surgical methods, in the after-treatment of these pitiful victims of industry has attained the greatest significance in our lives. For this reason we exert ourselves to search for ways and means even outside of the realm of pure surgery in order to prevent the occurrence of vertebral fractures in the miner. We are even now together with professional miners, engaged in testing appropriate preventative measures. (L. BOEHLER) HARRY A. SALER, M.D.

Bader L., and Gull L. Osteosynthesis with a Screw in Fracture of the Neck of the Femur (L'osteosintesi con vite nella frattura del collo del femore) *Chech. d. argenti di medicina* 940, 53

The screw developed by Putti is described in great detail and is the subject of profuse illustrations and diagrams alone and in situ in the femur of the cadaver. The screw was subjected to various mechanical stresses and strains by itself and then the experiments were repeated and elaborated with it in place in a femur. The results were tabulated and analyzed, and the following conclusions were drawn.

The screw is capable of compressing the proximal fragment so as to permit an efficient impaction of the fragments, without compromising the stability of the osteosynthesis. The fracture of the femoral neck treated with the Putti screw possesses

higher resistance to external forces than the values obtained by Kottwitz experimentally with the Smith-Petersen nail. Fractures treated by this method have also remarkable resistance to external rotating forces acting upon the diaphysis.

F. McCOWELL, M.D.

Magnuson, P. B. A Report of 59 Consecutive Cases of Ununited Fracture of the Neck of the Femur. *Surgery* 940, 7705

In 4 of the 59 cases reported, the four modifications of the Brackett operation as used there were 7 Whitman reconstruction, 5 high intra-trochanteric osteotomies, 4 Colonna operations, and 4 procedures which could not be classified as definite operations.

Females predominated in a ratio of 3. The average time between the injury and the operation was eighteen months. The average shortening before operation was 1 1/2 inches. In the following operation

1. the selection of the operative procedure the individual surgical risk involved for the patient is

one of the major considerations. The arthrotomy modification of the Brackett operation has not been shocking. High blood pressure was not considered a contraindication. Obesity complicated the mechanical difficulties, but it is not in itself a contraindication. Avertin with nitrous oxide was the anesthetic of choice and was used in all these cases. There were deaths in the entire series, including all types of operation, a mortality of less than 4 per cent. The operating time varied from forty-five minutes to one hour and ten minutes.

The basic principle to be fulfilled in this procedure is to reestablish normal weight-bearing between the shaft of the femur and the acetabulum. Whether the head should be interposed in one way or another depends largely upon its condition seen at the time of the operation. It is impossible to determine whether the head is viable or not solely with the roentgen rays. The type of operation is not decided upon until the fracture is exposed and the head, the remainder of the neck, and the upper end of the femur are inspected. In many cases in which the x-rays show necrotic areas and one would suspect that the head was at least partly necrotic in the sense of lacking circulation, it has been found that if put to work, the head will bear weight and function normally. Even after period of nine years of such apparently normal function, the x-rays have shown the same necrotic areas. The surgeon judges whether the head shall be removed or shall be put to work at the operating table, without any definitely preconceived ideas of what operation should be done.

If the head is firm and can be freely moved in the acetabulum after the fibrous tissue is thoroughly dissected away from the fractured surface and the rim of the acetabulum, or if there is any bleeding from the fractured surface of the head after the fibrous tissue is thoroughly removed, the head is fitted over the end of the shaft of the femur in the way described previously (Magnuson, P. B. Repair of Ununited Fracture of the Neck of the Femur. *J. Am. Med. Ass.* 93, 93, 70.) The author believes that, if the head is brought into close contact with

the upper end of a well nourished shaft and held firmly between that shaft and the acetabulum, the circulation is restored sufficiently to allow the head to function. The cartilage of the head and the cartilage lining the acetabulum must also be free from adhesions, and although there are frequently areas of erosion in this cartilage the head will bear

eight painful and remain freely movable. The cartilage should be examined as carefully as possible by rotating the head, but not completely displacing it. There must be sufficient capacity in the remaining head to allow excavation of proper size and shape to receive the upper end of the shaft. The fibrous tissue which frequently completely binds the head to the acetabulum must be removed to allow about a free motion of the remaining head. If this is not done the shaft will pop out of its new position. If an attempt is made to place the

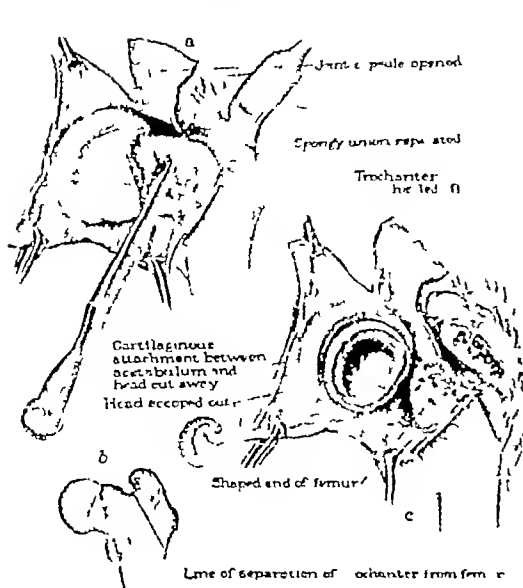


Fig 1 Second stage of reconstruction of hip a, Large mass of fibrous tissue between head and trochanter removed, b, line of incision for removal of trochanter, c, hollowed-out head and rounded end of shaft, the curves of which correspond

head in a valgus or adducted position in direct weight-bearing line with the shaft and it must maintain that position when the thigh is in not more than 15 degrees of abduction. If the upper end of the shaft slips out of the head when the leg is brought parallel to the long axis of the body, it is possible that there is a lever action between the shaft and the hypertrophied and scarred transverse acetabular ligament. It should be possible to place the head in marked valgus position without unduly stretching the ligamentum teres.

If these conditions can be met, the modified Brackett operation results in more painless, movable, weight-bearing hips than any other reported here, except the high oblique intratrochanteric osteotomy. This is done on cases that have good apposition, with the idea of restoring the weight-bearing line between the shaft and the head, when there is very heavy fibrous or partial bony union. In selected cases this gives good results.

A detailed description of the author's operative procedure accompanied by drawings is presented. This procedure has been used in 6 cases of fresh subcapital fractures with complete restoration to normal in all cases. In ununited fractures, however, because of the absorption of bone of the neck of the femur, the formation of large amounts of fibrous tissue within the capsule, the hardening of the capsule, and the weakness of the muscles from long disuse, this cannot be achieved. There must be

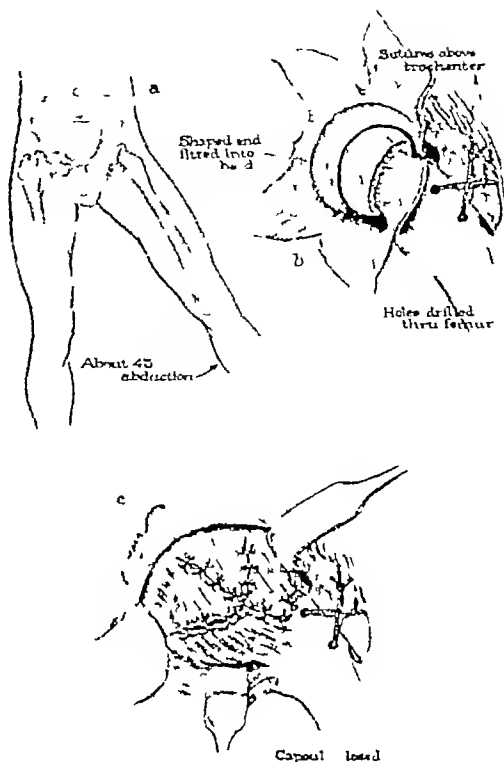


Fig 2 Third stage of operation. Rounded end of shaft fitted into hollowed-out head, trochanter replaced downward and outward from its original location a, Position of shaft in head at completion of operation, b, head hollowed out in the form of a parabola, with the end of shaft fitted into it and the trochanter attached to the upper end of the femur below and lateral to its former position, c, closure of capsule.

some shortening because of the absorption of the neck, and this in itself interferes with the normal range of motion in the hip. The amount of dissection necessary at the time of operation is so extensive that there is probably considerable scar tissue around the hip joint. Many months are required for the reestablishment of control of the hip joint by the muscles which are responsible for its motion.

Nevertheless, when the shaft of the femur bears weight in direct line with the head and into the acetabulum, a comfortable, weight-bearing hip with a movable head can be obtained. The patient can be restored to useful activity and be comfortable for the remainder of life so far as the hip is concerned, in spite of the fact that extremes of motion may never be established. Restitution to complete normal in the author's opinion is not to be expected in any reconstruction operation for long-existent ununited fractures of the neck of the femur.

Following the operation a heavy compression dressing is applied with a muslin bandage, and bi-

lateral Adams plaster boots are used with the hips abducted 3 degrees. These boots are bivalved and motion is started in the left leg in three or four days. Flexion of the knee and ankle and active mobile exercises are given daily. The patient is allowed to sit up in bed and is turned prone for one hour twice each day. Motion of the affected leg is started after a week, and, the cast being bivalved horizontally, the knee and ankle are given active exercise. The hip is flexed, but is never brought into more than 20 degrees of adduction and out as far as 45 degrees of abduction. When the patient is turned, after the first twelve weeks a pillow is placed under the knee of the injured leg in order to retain full extension of the hip.

Weight-bearing is permitted in eight weeks. There is no protection in the way of a splint. The patient is usually started at walking supported by two individuals in whom he has confidence. This is important. The surgeon and his first assistant can accomplish much more in the first two weeks than can be gained by the use of crutches in a number of weeks. It seems that the time of the surgeon and his first assistant is well spent in the first few days of walking, in the establishment of confidence in the mind of the patient that the hip is solid and weight can be borne without fear. The patient is urged to put full weight on the hip. There may be some tenderness, but it seems to be largely in the muscles and not in the joint. If the head remains firmly on top of the shaft, with direct weight-bearing between the head and the shaft and acetabulum, no pain occurs, the joint and the shaft is constantly forced into the head.

The percentage of bony unions is undeterminable. In patients who have been walking for eight or ten years after this operation, the return to continuous bony structure is so gradual that it has not been possible to determine when it occurs. It is believed that there probably is no bony union at the time

weight-bearing is allowed, but experience suggests that if the head is free in the acetabulum and the weight is transmitted in direct line with the head rigidly between the shaft and acetabulum, creeping substitution will be found to occur even if the head

In a instance there was microscopic evidence of bony union in a necropsy specimen obtained three months after the operation. The fracture occurred eighteen months prior to the operation. The head has flattening of the head, such as occurs following dislocation of the hip, been seen. Attention must be made of the distorted appearance of the hip seen occasionally following operation. It seems almost impossible to reproduce in the roentgenograms what is seen at the operating table. The cases which give an impression of great security and good alignment at the operating table show the shadow of bone a parent in position which could not bear weight yet the case progresses to a satisfactory result.

In the 4 cases reported, 28 of the results are good, painless functioning hips which bore weight painlessly allowed the patients to resume their former occupations. Among the remainder of the cases there have been 2 deaths. Of 6 the results were poor, the shaft having slipped out of the head with lack of weight-bearing stability. In one of these Whitman operation has been done and another high osteotomy (within the last two years). In both of the cases there now is weight-bearing with comfort. One head collapsed and gradually disintegrated except for the weight-bearing fragment but the function remained good. One case is doubtful. The patient felt that the hip as much as proved. She was walking with a cane but it could not be determined that there was good weight-bearing and in the author's opinion the lower trachea was bearing against the lower edge of the head which had rotated into valgus position.

ROBERT P. McIVER, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Hawkes, S Z, and Hewson, G F. A Study of Varicose Veins. *Surgery*, 1940, 7 714

Six hundred consecutive, unselected cases of varicose veins were studied and treated under the supervision of the authors. The patients included 441 women and 159 men, an approximate 3:1 ratio. This inequality between men and women suggests the association of the ovarian endocrine system with the development of varicose veins. The ovarian endocrine system might help to explain the high incidence of this condition in women between the ages of forty and forty-nine years, during the period of the menopause.

Childbearing and a positive family history, together with phlebitis and injuries, are the underlying factors in the production of varicosities. Pregnancy is the most common predisposing factor. The laboring class suffers less from varicose veins than the non-laboring class.

Ligation of the saphenous vein was found necessary in 74 per cent of the cases, and nearly half of the patients required the operation on both legs. When a ligation is not indicated, the treatment consists of injections alone.

Twenty-five per cent of the patients in this series developed ulcers. Ulceration usually occurs only after the tissue vitality has been lowered for many years by the stagnant incompetent circulation with its resulting anoxemia and tissue injury. The treatment of the ulcers consists in eliminating back pressure and in combating infection. In the acutely inflamed ulcer bot hypertonic solutions are used at first, together with rest and elevation. In selected cases Unna paste boots are applied from the toes to the knee. As soon as the acute inflammation has subsided, ligation is done.

An ideal sclerosing solution should give maximum thrombosis with minimum pain, without producing allergic reactions, and without causing tissue necrosis. There is no solution which meets all of these requirements. A solution containing 30 per cent invert sugar and 10 per cent sodium chloride has been used routinely for the large veins. The resulting thrombosis is good and sensitivity never occurs.

Of the several contraindications to treatment, block of the deep venous return is the most important. A past history of phlebitis and an abnormal appearance of the leg may cause one to suspect a block of the femoral vein. Perthes' test will quickly demonstrate a venous block. A dirty ulcer should be cleaned up before injections are started. During active phlebitis, injections are for the most part contraindicated. A patient with active syphilis should be treated for the syphilis before the veins are sclerosed. The authors do not consider controlled diabetes a contraindication to treatment. A patient

having cardiovascular disease with decompression should not receive treatment by injection. Patients having varicosities are not treated during pregnancy because the veins frequently disappear after parturition and also because of the added danger of phlebitis.

The results in this series have been very good. The most difficult cases have been those with a previous deep phlebitis and marked edema of the leg with ulceration. The use of the two point ligation has been very successful in aiding the type of vein pathology in which the communicating veins passing from the deep to the superficial circulation have incompetent valves. In these cases a high ligation is not sufficient to check the reflux, and subsequent injections will be quickly recanalized.

HERBERT F THURSTON, M D

BLOOD, TRANSFUSION

Kretnin, S. The Effect of Sulfanilamide on the Cross-Matching of Blood. *J Lab & Clin Med*, 1940, 25 699

This study was conducted to determine the effect, if any, of sulfanilamide upon the cross-matching of blood. Upon admission to the hospital the blood of each of the 24 patients studied was typed and cross-matched. A complete blood study (red-blood-cell and white cell counts, sedimentation time, and blood chloride determination) was also done. Sulfanilamide in doses of from 15 to 20 gr, with sodium bicarbonate was given every four hours for a period ranging from forty-eight to seventy-two hours. Following this, a sulfanilamide concentration test (Marshall's method) was made and the patient was recross-matched. Again the sedimentation time and the blood chloride were determined.

Although the number of cases reported is too few for final conclusions to be drawn, certain facts are apparent. Sulfanilamide *per se* does not disturb the cross matching of blood. The sulfanilamide concentration test being accepted as an indication of the ability of the patient to absorb sulfanilamide, it was noted that there was a wide variation in the rate of absorption and excretion of the drug. One patient who had received 120 gr of sulfanilamide exhibited 15 mgm per 100 ccm of blood, another patient under the same dosage had none in the blood. One patient who had received 300 gr of the drug had a concentration of 3 mgm, while another who had received 100 gr had a concentration amounting to 18 mgm.

From this study the authors conclude that the inability to cross-match blood following the administration of sulfanilamide is due to changes in the blood brought about by the disease requiring the use of sulfanilamide rather than to the drug itself.

HERBERT F THURSTON, M D

Ayl and F. A. Malmaring, B. R. S., and Wilkinson, J. F. The Effect of Some Preservatives on Stored Blood. *Lancet* 1940, 38 685

The authors note that although many investigations have been made on the preservation of blood, comparatively few have included studies of the chemical changes. Blood is a highly complex physicochemical system and changes may arise through alterations in the organic constituent by diffusion across the membrane of the red cell, or by liberation of the cell contents after rupture of the cell membrane. In the experiments described and reported herein the authors have limited their discussion to hemoglobin and potassium and phosphorus compounds, because these constituents are present in widely different concentrations in the cells and plasma of normal blood.

The technique of the experiments is reviewed in detail. The observations of the authors are recorded. The authors conclude that in the plasma of stored blood there is an immediate rise in potassium, an initial fall followed by a gradual rise in inorganic phosphate and a delayed and gradual rise in hemoglobin. Since there is no direct correlation between these changes, different processes must be involved.

In blood stored with the minimum of dilution, citrate-glucose appears to be definitely better than citrate alone, and both are better than heparin as anticoagulants in delaying hemolysis and in retarding the chemical changes in the cells leading to increased values for plasma inorganic phosphate. None of these anticoagulants prevented the diffusion of potassium into the plasma, but over a long period the citrate-glucose showed a lower value for plasma potassium, probably because of the lower degree of hemolysis.

Alexander F. TERTRETT, M.D.

RETICULO-ENDOTHELIAL SYSTEM

Bastie, A. The Reticulohistiocytary Neoplasm Located in the Lymph Nodes (Le neoplasme reticulo-histiocytairé nodale linéoglandulaire). *J. n. ch. de ch.* 1940, 9 57

Bastie describes a personal case of reticulohistiocytary tumor of the lymph nodes and 3 cases found in the collection of the laboratory of General Pathology of the University of Marseille. In the first case the initial histological findings suggested the presence of a typical endothelioma, but the subsequent evolution of the tumor showed all the characteristics of reticuloma; this supports the concept that the tumors deriving from the endothelium of the lymphatic vessels belong to the reticulomas. The second case was a reticular form of reticulo-endothelioma with very malignant histological characteristics. The third case was distinguished by slightly typical cells with very rare karyocinesis. The fourth case was one of the frequent syncytial forms found among the various reticulohistiocytary tumors.

It is difficult to estimate the frequency of occurrence of reticuloma, because its clinical diagnosis is im-

possible and even its histological diagnosis presents difficulties. The tumor seems to be rare and to belong especially to youth and adult age. Its etiology is unknown but infection in general appears to be an adjuvant factor and undoubtedly causes proliferation of the cells of the reticulohistiocytary system which may favor the origination of the tumor. From the histological point of view the tumors are divided into reticular forms, in which there is strong development of the fibrils, some forms having a syncytial aspect and some having a carcinomatoid aspect.

The reticular form is very malignant, progresses rapidly and soon leads to cachexia. It presents an undifferentiated aspect which recalls embryonic mesenchymal tissues. The cells have a little protoplasm, a clear nucleus with nucleoli, and numerous prolongations extending in various directions and anastomosing irregularly to form a network. The cells appear immersed in this network and are decidedly atypical. Nuclear monstrosities and asymmetrical and pleomorphic mitoses are frequent. They may be elongated and arranged in bundles so as to imitate fusocellular sarcoma. On the other hand, there is a tendency toward differentiation, as shown by the phagocytic property exhibited by some of the cells.

The syncytial form is also malignant, progresses rapidly and leads to cachexia and death. It is characterized by a fine connective-tissue framework formed by bundles of collagenous fibers which surround neoplastic masses or cords consisting of cells with a single elongated, round, or polygonal nucleus and syncytial zones. Usually these zones constitute the largest part of the tumor and are formed by protoplasmatic masses of varying size without cellular delimitation and with numerous nuclei, for the most part close together. Zones of necrosis are frequent.

The carcinomatoid form consists of cords of cells recalling carcinoma; these masses may be separated by sinusoid formations, at the limits of which the cells are differentiated into endothelium. Some of the cells show distinct phagocytosis. Histologically and clinically some of these forms are only slightly malignant.

The clinical symptoms of reticuloma are not characteristic. The disease begins with swelling of one or more lymph nodes of the upper part of the body, principally in the lateral cervical region. The swelling increases slowly, reaches a variable size and spreads to neighboring lymph nodes. The nodes are hard and painless, and adhere to the underlying tissues and later to the skin. Usually there is no fever. There is always some anemia, slight leukocytosis or lymphopenia, both with neutrophilia, has been reported in some cases, but monocytosis, if present, is more important. The course of the disease is always malignant, but its duration varies. Local recurrence is frequent. When the neoplasm is limited to one or few lymph nodes superficially located, early excision is the treatment of choice.

Roentgen irradiation is rather efficacious and may relieve the patient for years, it is indicated in diffuse tumor or in inoperable cases, because nearly all forms of reticuloma are roentgen sensitive

RICHARD KEMEL, M D

LYMPH GLANDS AND LYMPHATIC VESSELS

Roos, B Cerebral Manifestations of Lymphogranulomatosis Benigna (Schaumann) and Uveoparotid Fever (Heerfordt) *Acta med Scand*, 1940, 104 123

The author notes that the causes of both benign lymphogranulomatosis and of uveoparotid fever are still obscure, and it has not been proved that these two disease pictures are parts of a larger disease entity. It is certain, however, that the two are closely related clinically, and in many cases there is much that indicates a common cause.

Prior to this report, 9 cases of benign lymphogranulomatosis in which neurological signs had occurred were reported in the literature. Three additional cases with neurological signs are now added to these. One case of benign lymphogranulomatosis occurred with diabetes insipidus, another, in an infant, with convulsions and changes in the cerebrospinal fluid. At autopsy of the latter there

were granulomatous formations in the falx and tentorium cerebelli. In the third case there was facial paralysis.

Signs of a disturbance in the nervous system are relatively frequent in uveoparotitis. The most common neurological disorder is facial paralysis. Facial paralysis was found in 12 of a series of 40 cases, and in 3 of these it was bilateral. It was present in 22 of another series of 45 cases of uveoparotitis.

The author in a brief summary makes a comparison between the cerebral signs which appear in cases of benign lymphogranulomatosis and of uveoparotid fever. Striking similarities in cerebral signs appear despite the rather variegated symptom pictures and the small number of cases. In both groups there are signs of meningeal irritation and of pathological processes in various places in the brain. A definite tendency to basal localization is also seen. The fact that the hypophyseal region is so often involved merits special attention. While these similarities between benign lymphogranulomatosis and uveoparotid fever do not permit any conclusions as to the common origin of the two conditions, it is interesting that even the symptoms produced by the cerebral localization of the morbid processes exhibit rather striking likenesses.

HERBERT F THURSTON, M D

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE POSTOPERATIVE TREATMENT

Spetham H. L. Subendocardial Hemorrhages I
Shock. *Lancet* 940, 31 83

Subendocardial hemorrhages, localized to the left side of the interventricular septum and less often also to the musculi papillares and trabeculae of the left ventricle, are almost invariably present in obstetrical deaths from shock except when the patient dies rapidly. The fact that they are also found in deaths from various kinds of cerebral lesions suggests a possible nervous mechanism for their production in shock. They are presumably post-mortem indications that a vascular disturbance in this region has been present for some time before death, but the relationship of this vascular disturbance to the syndrome of shock is not yet elucidated.

SAMUEL KARP, M.D.

Best, C. H., and Solandt D. Y. Concentrated Serum in the Treatment of Traumatic and Histamine Shock in Experimental Animals.
Br J Surg 940, 799.

The authors describe experimental work in the treatment of shock. They believe that the basis of traumatic shock is the fall in the volume of circulating blood. This may be due to frank hemorrhage, to fluid exudation from tonic capillaries, or to stagnation in dilated capillary bed. They believe that the methods of treating shock must aim at halting these processes and correcting their results. They believe that any procedure useful in severe shock should be initiated by the administration of a vasoconstrictor temporarily to correct vascular tone so that solutions introduced into the blood stream are not lost immediately into the tissues. For this purpose they use both pituitrin and adrenalin.

Shock was first produced in a series of dogs with histamine and by striking the animal on the thigh with a heavy steel or small rubber hammer. Continuous blood-pressure readings are then taken. It was found that in both dogs shocked with histamine and those shocked by trauma the best results were obtained by the administration of a vasoconstrictor substance followed by a liberal quantity of concentrated blood serum. They found that pituitrin the vasoconstrictor of choice even though tolerance had to be built up to it. In their experiments they found the immediate effect of the osmotically equivalent 20 per cent dextrose, 5 per cent sodium chloride solution, or three-times-concentrated blood serum to be about the same. The effect of dextrose is much more prolonged than that of salt solution, but in their experiments concentrated blood serum was still superior. Hematocrit determinations were made and demonstrated that in all types of shock there was definite concentration

with respect to the red blood corpuscles. However they do not record the effect of this treatment upon the blood concentration.

The authors conclude that in shocked animals, whether the condition be initiated by histamine or trauma, a definite benefit is derived from the primary use of pituitrin given intravenously followed by an adequate quantity of concentrated blood serum. Their experiments indicate that in traumatic shock, at least, the injection of a hypertonic fluid is more beneficial than injection of an isotonic fluid of the same constituent. They believe that these experiments should encourage a trial of pituitrin and concentrated human blood serum on patients suffering from severe traumatic shock.

WILLIAM C. BRON, M.D.

Gordon-Taylor G. A Further Review of the Intertrunculo-Abdominal Operation. *11 Personal Cases. Br J Surg* 940, 57 643.

Eleven cases are reported, in which the intertrunculo-abdominal operation (quadrantary amputation) was done for malignant involvement of the upper end of the femur, the innominate bone, the muscles of Scarpa triangle and the psoas muscle. The magnitude of the operation inevitably leads to a mortality of about 1 in 3. Any great diminution in the mortality rate is hardly to be expected, despite an increased familiarity with the operation and the great improvement in pre-operative and postoperative therapy.

The desirability of nerve blocking by spinal anesthesia and local infiltration of individual nerves before their division is emphasized. The institution of some form of drip infusion, before the start of the operation, is also recommended, since in this way the introduction of saline solution or blood can be regulated to meet the requirements of the patient.

SAMUEL KARP, M.D.

ANTISEPTIC SURGERY TREATMENT OF WOUNDS AND INFECTIONS

Achuths, M. N. First Aid in Gunshot Wounds.
Am J Surg 940, 43 93

Narrow canals created by gunshot injuries should be widely exposed, the incision being carried not only through the skin and subcutaneous tissues but also through the fascia because the hematoma is usually located within the muscles. Retention of sutures placed after the introduction of a sponge clove the wound hermetically and thus favor development of septic or necrotic phlegmon.

Complete excision of the wound can be performed only in a limited number of cases because the removal of tortuous canal in the presence of torn injuries of the muscles, fascia, blood vessels, and nerves creates large defects with resulting functional

disturbances Furthermore, the technique of a properly executed débridement requires numerous instruments, and a prolonged observation of the patient is highly desirable Such conditions cannot be met at first-aid stations under war conditions Moreover, many injured soldiers do not reach the first-aid units early enough to justify an extensive operation with the hope of avoiding infection A complete excision is not indicated in injuries with comminuted fractures, abdominal traumas, and gunshot wounds of the soft parts of the trunk and extremities, or injuries of tissues in the close vicinity of blood vessels and important nerves On the other hand, in tangential injuries of the trunk and extremities a débridement can be easily performed, but this type of injury heals without any surgical interference

As to facial injuries, the excellent blood supply secures healing even if the wound is not excised

In brain injuries, the author removes only osseous fragments and parts of the bullet located close to the surface and therefore easily accessible, deeper situated fragments are not removed in order to avoid infection of the adjoining healthy portions of the brain After the excision of the crushed teguments, débridement of the margins of the bone and removal of accessible foreign bodies from the brain are done The crushed brain tissue is washed out with physiological saline solution and after careful hemostasis the torn dura mater is trimmed without any attempt to suture the structures Otherwise an acute infectious process may develop and an accumulation of lymph and an inflammatory edema may produce a hernia of the brain

The insertion of sponges and application of thick dressings in injuries of the chest which are complicated by an open pneumothorax should be condemned A tamponade is permissible only in first-aid stations, but further back in the field an excision of the wound and suture of the muscles and pleura, the defect in the skin being left intact, is indicated A primary suture of the entire wound causes a grave phlegmon of the chest wall, with a resulting cutting of the sutures and spontaneous reopening of the wound A blood transfusion greatly improves the operative results

Penetrating injuries of the abdomen require an operation after a preliminary intravenous injection of glucose and saline solution, which should be supplemented by a blood transfusion if a hemorrhage is suspected The operation should be performed as rapidly as possible Ether anesthesia produces an undesirable fall of the blood pressure and therefore may be replaced by an intravenous evipal anesthesia On the average, from 15 to 20 cc suffice The drug has a slight depressor effect The author prefers a combined ethyl chloride ether anesthesia because it rapidly produces sleep, requires a very small amount of ether, and shortens the period of excitation Whenever possible, he sutures the perforations in the intestines, without resection, in the presence of extensive injuries of the large intestines,

an exteriorization of the traumatized segment is recommended because primary resections are not well tolerated by gravely injured soldiers Irrigation of the peritoneal cavity is not done by the author, but he uses sponges saturated with rivanol, soiled omentum is resected If the intestines are perforated in only a few places and no feces are found in the peritoneal cavity, the latter is sutured without drainage

Injury of the kidneys requires operative intervention only in the presence of a progressive anemia or an increase of retroperitoneal hematoma Urinary suffusions may follow suture of a wound of the bladder and the introduction of a retention catheter, and therefore the author insists upon a suprapubic cystostomy This operation is also the method of choice in injuries of the proximal portions of the urethra

In fractures the author recommends an extensive débridement with excision of the injured soft parts and removal of foreign bodies and free osseous fragments A dressing saturated with a 2 per cent chloramine solution or rivanol is applied and the injured extremity is immobilized

As a rule injuries of articulations are treated in a conservative manner, by immobilization if the port of entry is small If an extensive injury of the soft parts without great comminution of the bones is found, a débridement followed by suture of the capsule but not of the skin is suggested Extensive injuries of the bones require primary resection,

JOSEPH K. NARAT, M D

Desjardes, R., and Auger, P. Some Reflections on the Wounded of the Spanish War (*Réflexions sur les blessés de la guerre d'Espagne*) *Lyon chir.*, 1939-1940, 36 645

The authors treated personally at the Hôtel-Dieu at Lyon 68 wounded soldiers, 56 of whom had come directly from Spain and 12 of whom had been previously treated elsewhere in France and later referred to this hospital

Even the least seriously wounded were in such an advanced state of malnutrition and fatigue that feeding caused gastro-intestinal upsets, chiefly diarrhea Almost all had scabies

Much time had to be spent in removing plasters of all types and constructions, inscribed with the name of the surgeon, the date of injury, and the deformity, in changing dressings which, like the plasters, were very odorous, in providing antitetanic serum and vaccination, and in taking x-rays

The average ages of the patients ranged from twenty to thirty years with extremes of seventeen and fifty-one years Four patients died and the causes of death were brain abscess, caseous pneumonia, septicemia from an infected knee, and fungus cerebri with meningitis

The wounded were classified under the following headings

(1) Leg amputations, 7 cases Two were done at the Hôtel-Dieu for osteomyelitis of the tibia and for

suppurative arthritis of both knees, respectively. Five had been done before arrival of the patient needed plastic operation on the stump.

(1) Compound fractures, 15 cases, comprising 1 of the maxilla, 5 of the humerus, 3 of the forearm and elbow, 3 of the femur, 2 of the tibia and of the astragali.

(3) Suppurative lesions, 1 cases, comprising 6 abscesses and phlegmons of the lower extremity of the upper extremity, 1 of the lumbar region, 1 pleural fistula, of the neck, and 1 proctitis.

(4) Serious nerve lesions, 4 cases, comprising 1 lesion of the cauda equina with urinary incontinence, 1 lesion of the thoracic cord with paraplegia, 1 paralysis of the brachial plexus caused by scar tissue, and division of the tibial nerve. The latter 3 cases were operated upon successfully.

(5) Foreign bodies, 3 cases (only large foreign bodies were included in this group) case involving the calcaneus, 1 the carotid region, and the pectoral muscle.

(6) Fistulas and sinuses, 9 cases, 1 of which was vesicorectal.

(7) Simple leg fractures, cases.

(8) Non-surgical affections including scabies, bleenorragia, malaria, psychoses, herpes, arthritis, and pulmonary tuberculosis.

The authors deplore the prevalent practice of war surgeons of covering contaminated wounds with dressings and plaster of Paris as the only treatment. They emphasize that the fundamental surgical principles for treatment of wounds should not be forgotten and that immobilization in plaster is only an adjunct. RICHARD WARREN, M.D.

Reimers, C. The Care of Bomb-Injuries in Base Hospital. From Experiences in the Chinese War (Ueber die Versorgung von Bomben-Verletzten in einem Basishospital. Nach Erfahrungen auf dem chinesischen Kriegsschauplatz) *Chirurg* 940.

45-

This is a most interesting and instructive work for the war surgeon. Reimers draws a sharp line between field surgery i.e. that of the war of movement, and war surgery on native soil, or behind the lines in base hospitals. In the former many things are impossible which are practicable in the latter. In the former there are other indications and different methods of treatment than in the latter. During the stationary war of the World War many *Hammag-Voes Panzerwagen* (German make of closed trucks) were converted into good ambulances, and many field hospitals were transformed into well equipped hospitals. In his base hospital, Reimers saw also many old gunshot wounds. The fresh ones were almost entirely bomb injuries sustained from bombing planes. In the war of movement in 1936 he frequently came across emergency bandages coated with black, damp earth and grass pulp, and it was remarkable that although there are numerous cases of gas gangrene there were none of tetanus. Since 937 bandage kits have been introduced in

China. Much damage has been done with tourniquet bandages which are often the forerunner of gas gangrene. Tourniquet bandages should not be handled by lay persons. In cases of fresh bomb injuries, tourniquets rarely come in question, since serious hemorrhages do not occur as a rule. Man injured are put in emergency or regular Crumer and wooden splints. Isolated cases are treated with extension splints, particularly by American surgeons. The results seen by Reimers are poor since serious pressure resulted. The ambulance corps must be well trained in the use of such splints. Reimers is right in stressing that in cases of mass injuries the Chief Surgeon must take charge of examinations and determine the order of operations.

Serious cases of shock which did not readily respond to intravenous injections and elimination of pain were temporarily put aside. The most important question is the elimination of pain. Morphine is good but does not eliminate pain entirely. In many cases the local injection of novocaine is of more use. Reimers stresses in particular that shock can be eliminated much more quickly with this method than with any other.

In severe injuries to the extremities he uses spinal or pleural narcotics. No advantage was seen in transectional amputations. From his own experience Reimers holds the assertion that novocaine-adrenaline injections favor gas gangrene and therefore should be avoided, as unjustified. Experimentally he has used local anesthesia, but this is not possible in field surgery where general anesthesia takes first place. Local anesthesia was used in 33.4 per cent of 1973 cases of war surgery: spinal anesthesia in 20.5 per cent and neural anesthesia in 8.0 per cent. 81.9 per cent received local and pain-eliminating anesthesia. Stupor was used in 8 per cent, general ether anesthesia in 5.4 per cent, and for 6.6 per cent there was no record.

Bomb injuries are generally similar to artillery injuries. Torn-off bomb fragments of lead occasionally may cause smooth, sharp wounds. Reimers stresses that the extent of muscular damage and skin defect is the decisive factor for infection. Injuries were represented as follows: face 5.8 per cent, skull 7.6 per cent, spine and back, per cent chest 3.2 per cent, abdomen 2.4 per cent, pelvis 5.0 per cent, upper extremities 3.4 per cent, lower extremities 34.9 per cent, gunshot wounds in the soft tissues 70 per cent, and bone injury from gunshots 30 per cent. Among the gunshot wounds were 49.7 per cent caused by pistol and infantry rifle, 47.7 per cent by artillery and 6 per cent undetermined.

Gas-edema infection was frequent (percentage not quoted). At times Reimers saw it develop already few hours after injury (favored by tropical climate). It requires immediate surgical intervention. In cases in which gas gangrene has already set in, and serious damage from injuries requiring amputation is present, the author recommends an immediate tourniquet bandage at the point of the intended amputation. He has never seen gas gangrene spread

beyond the point of the tie-off. Furthermore Reimers expresses his opinion most convincingly about Friedrich's wound resection. The six-hour limit is not always correct. For example, he cites a case in which he had to perform an amputation of the upper leg on account of a smashed lower extremity in an otherwise healthy individual, although the amputation took place within about one hour after injury, gas gangrene resulted just the same, but recovery followed after further incisions had been made.

Total excision should not be extended to severe gunshot injuries, since it always remains an incomplete procedure and "the end result is always an infected wound." If a smashed region is to be radically resected, it should be amputated. It need not be emphasized that primary suture should not be considered after a check-up of the injuries. The author is rather reserved regarding bone splinters and lodged shell fragments. X-ray pictures may be misleading even in cases of osteomyelitis he has refrained from premature intervention. The author finds it striking that in cases of gunshot injury to the joint, frequent reference is made to primary suture of the joint capsule. He has rarely used this method because the capsula articularis is usually too severely damaged. In such cases, however, he was able to prevent secondary infection of the joint by primary skin graft transplantation. "If a skin graft covering was not successful, kinesitherapy according to Willem's was attempted in cases of knee, ankle and elbow joints." The author will report more about this method at a later date.

Skin grafting was also used in fractures, but only in the absence of serious muscular injuries (for instance in centrifugal gunshot of the tibia). Finally, the author mentions injuries caused by collapsing structures and burns from electricity. The latter occur frequently during bombing raids when insulations are destroyed after the collapse of houses. The burns were often of the third and fourth degree, they were treated with tannin and all recovered. Superficial shot wounds played a subordinate rôle. However, at times even small shell fragments showed a tremendous penetrative power.

(FRANZ) HILDA H. WULLEN

Decker, P., and Rossier, J. **Cranio-cerebral Wounds in War Surgery** (Les plaies crâniocérébrales en chirurgie de guerre) *Rev. méd. de la Suisse Rom.*, 1940, p. 321.

Decker and Rossier note that the cranio-cerebral wounds of war differ from those of civil life in that they are more frequently open wounds subject to danger of intracerebral infection. In addition, there are usually diffuse cerebral lesions due to the shock of the projectile against the skull, if not cerebral lacerations caused by the penetration of the projectile. The severity and extent of the lesion of both the skull and the brain depend upon the nature of the projectile and the direction in which it enters the skull. In cases in which the dura is not broken, the condition is less serious than in those cases in

which the dura is penetrated. The infection may be primary, from micro organisms carried into the brain by the projectile or fragments of the fractured skull, or it may be the secondary infection of an open wound. Cerebral infections, even when primary, are slow to develop, and clinical signs of such infection are not immediately evident.

The diagnosis of cerebral injury in war wounds is not necessarily evident. In cases in which the lacerated cerebral substance is visible at the base of the wound, or in which two cutaneous openings indicate the course of the projectile through the skull and brain, the diagnosis is evident. However, in cases in which there is a single exterior wound, it is often difficult to determine whether the brain or even the skull has been injured. Roentgenological examination may show the presence of a skull fracture with penetrations of fragments into the brain or it may show the projectile, but a negative roentgenogram does not necessarily indicate that there is no penetrating wound. All scalp wounds should be carefully explored.

If the cerebral lesions in war wounds are of the same type as those in civil life, i.e., commotion, concussion, compression by extradural or subdural hematoma, and diffuse circulatory phenomena, the treatment is the same. In the more typical cranio-cerebral war wounds with exposure of the brain and rupture of its covering by penetrating projectiles, treatment to avoid the development of primary or secondary infection is definitely indicated. The method used and advocated by all surgeons in the last World War and used by the authors is the excision of the wounded tissue in all layers, and primary suture of the wound in two planes (sometimes completed by a cranioplasty). This treatment need not necessarily be employed until after the first twenty-four hours in order to permit some recovery from the primary effects of the cerebral trauma. In such cases the wound is not disinfected—even the hair is not shaved, the wound is merely covered with a sterile dressing. This is important for the wounded in war who are not submitted to immediate operation. After operation, the patient should be under the surgeon's observation for from fifteen to twenty-one days, the dressings should be changed by the surgeon in the operating room. In regard to the removal of projectiles from cerebral wounds, the authors agree with the rules laid down by Rouvillois and others: projectiles situated at the base of the brain near important nerve centers, those of very small size, and those situated at a distance from the point of entry should be left *in situ*, in the latter case it may be possible to remove the projectile by a route of operation not related to the point of entry.

In dealing with the wounded with cranio-cerebral lesions, immediate operation is indicated in those with cranial hemorrhage and those who show signs of cerebral compression. An operation, even if not of the best type, is their only chance. If sent to the rear without operation, they die in transport. Soldiers with multiple wounds and much bleeding (un-

(cl d g cerebral wound) in a state of shock should be treated at the field hospital dressing station for shock and anemia they should be sent to the rear within seventy-two hours, where operation can be done for the cerebral wound. The same plan should be carried out for soldiers with cranial wound in a state of shock or cerebral commotion an immediate cerebral operation is not necessary in these cases. The patients should be rendered transportable before being sent to the rear. Other patients with head wounds should be sent to the rear at once, to a hospital where the necessary operation can be done. Those with head wounds who are to be transported to the rear should have the head immobilized by a light metal apparatus and should be kept in a sitting position. (Arch. St. Mente.)

Schiassi B. How Far Have We Gone in the Treatment of Infected Wounds? (War Fractures) (A che punto siamo nella cura delle ferite infette? [comprensive le fratture di guerra]) *Palidina, Rome* 1919, 47 sez. prat. 755, 30p.

The author states that he has not been satisfied with the former theories of flooding the infected wound with antiseptics from outside to within the wound. He recalls Lencze's pronouncement in 1910 that we should treat the wound from within to the outside. The author calls attention to the same principles which he himself enunciated in the Surgical Society of Bologna in 1917 deprecating antiseptics from without and treating the wound from within. In his work the author has been inspired by a statement made by Pasteur in his last days. C. Bernard is correct—bacteria are important but the terrain is everything.

Contaminated wounds treated within the first six to eight hours are cleansed thoroughly and irrigated with chloramine solution any pockets are incised, under anesthesia if necessary and exposed to treatment. A y suture is done after several days. In the presence of full-fledged infection the author doubts the efficacy of Dakin solution, except as a cleansing agent by irrigation. He is not satisfied with the chemical treatment of infected wounds and suggests the correctness of the old hy-

pothetic doctrine that the best treatment is the most natural treatment. The author suggests that the blood itself may be used as an internal medium of treatment as it promotes internal respiration of the tissues he deprecates Bier's passive hyperemia in that it depraves and interferes with this function of the tissues.

The author notes that we have various means at our disposal for promoting hyperemia in tissues. Thus obtaining physiological changes through the action of the serum and the blood elements. He emphasizes chiefly local and general baths to obtain these ends. These baths affect the chemical, physical, biological, vascular and nervous reactions of the tissues—in other words, they alter the terrain. Furthermore, with the general baths the entire skin surface is stimulated and the entire body responds. The author describes and illustrates local baths for the extremities which are immersed in hypertonic solutions containing sodium, potassium, and calcium chloride. These treatments last from three to five hours at 37.5, 37.5, and 37.8 degrees C.

The author ascribes great importance to the general baths as they affect the nervous, vascular, muscular, absorptive and secretory powers of the skin. They may be used to stimulate the humoral and defensive processes of the entire body. The author presents illustration of the general bath with rubber pulleys arranged above which draw up the patient and entire stretcher frame for total immersion of the body. This exerts an anesthetic effect as the pain caused by the inflammation. There is resultant exosmosis of the inflammatory products from the depths of the tissues to the surface.

The author then discusses the treatment of fractures. For transportation he offers his own modification of the Thomas splint, first reported in 1918. Compound fractures are treated early by washing out the wound with detergent and by immediate reduction of the fracture. There is no attempt at drainage or suture. The limb must then be immobilized with traction. The author points out that immobility, elevation, and suppression of pain are the three conditions necessary to promote cure and to control the infection. The elimination of the products of inflammation must be encouraged. The author does not favor the Orr Trueta closed treatment because it eliminates the latter possibility. He uses neither gauze nor drainage tubes in his open infected cases. He concludes by emphasizing the great hygienic, phoric, sequestrant nature—

—follow nature. (Jacob E. Klein, M.D.)



Fig.

Gold, H. Active Immunization Against Tetanus by the Combined Subcutaneous and Intranasal Routes. A Simple Procedure for the Viral Remanence of Protect Antitoxin Titers. *Am J Surg* 1919, 45, 359.

While undoubtedly efficacious, immunization by means of tetanus toxoid administered parenterally has the drawback of requiring repeated injections at the time of injury. Intranasal immunization

against tetanus is feasible and practical if it is looked upon as a means of creating a state of antitoxic immunity in advance of an injury. In order to produce and maintain this state of immunity, it is necessary first to render the subject capable of responding to tetanus toxoid topagen stimulation intranasally by means of the previous injection of two 1 ccm doses of alum precipitated tetanus toxoid given ninety days apart, and then to repeat the course of nasal instillations every six months.

The author used tetanus toxoid topagen intranasally in 145 human beings. From this work, he concludes the following:

When tetanus toxoid topagen is instilled in the nose it is absorbed rapidly and in sufficient quantity to bring about a rise in antitoxin titer in subjects who had previously undergone active immunization against tetanus by means of 1, or preferably 2, injections of alum precipitated tetanus toxoid.

When 0.10 ccm of tetanus toxoid topagen is dropped into each nostril on two or three successive days, or at weekly intervals, it will raise the antitoxin titer of actively immunized individuals from less than 0.10 unit to or above the 0.10 unit level in from seven to nine days. The titer will remain above the protective level for at least several months.

No systemic, but only a transient local nasal reaction occurs after the instillation of tetanus toxoid topagen.

Active immunity can be maintained in advance of an injury by the repeated use of tetanus toxoid topagen intranasally. A course of 3 daily instillations should be repeated every six months.

The method of administration of tetanus topagen is simple. The patient is placed on a table with his head in hyperextension. An ordinary glass dropper is then inserted on one side of the nose, with the blunt end pointing toward the turbinates. About 0.10 ccm (2 or 3 drops) of the tetanus toxoid topagen is then squeezed out by pressure on the rubber bulb. The patient is asked to "snuff up" the drops, and the dropper is then removed and wiped with an alcohol sponge. This process of instillation is repeated in the other naris. The subject is kept in the recumbent position for two or three minutes and is told not to blow his nose for a few hours. As expected, this request was not complied with in every case. The intranasal instillations were repeated daily or weekly, two or three times.

No attempts were made to select any of the patients. Several received the tetanus toxoid topagen while suffering from acute coryza, when their noses were stuffy and filled with mucus. No irrigating solutions or vasoconstrictor drugs were used prior to the instillation. Many patients had deviated nasal septa which made the introduction of the dropper difficult, and in 4 individuals the obstruction was so marked that the drug had to be dropped in at the external opening of the nose.

About one third of the treated subjects complained of burning in the nose immediately after instillation of the drops. This lasted two or three

minutes. In some, there was lachrimation. Two non allergic patients sneezed frequently for a few hours following treatment. In subjects suffering from hay fever or allergic coryza there was a definite increase in the severity of this local reaction which assumed the form of a "head cold" and cleared up overnight. There was no disability. A few subjects complained of an unpleasant taste when the tetanus toxoid topagen reached the throat, but this sensation disappeared rather quickly. The local reaction which was undoubtedly due partly to the high glycerin content of the preparation did not interfere with completion of the course of instillations. No systemic reaction such as fever, malaise, urticaria or asthma was encountered. All patients preferred the nasal rather than the injection method of treatment. SAMUEL H. KAPIN, M.D.

Ciancarelli, S. Sixty-Five Cases of Tetanus (Rilevi clinici e terapeutici su 65 casi di tetano). *Pedidia*, Rome, 1940, 47. 567. *Chir.* 09.

The 65 cases of tetanus here reported were treated in the R. Clinica delle Malattie Infettive during the last four years. The highest incidence of the infection was found to occur in summer, 48 cases occurring in males who showed a substantially higher mortality than the 17 females. This was in contrast to the other series. Age appeared to have little influence, and the victims ranged from ten days to eighty three years of age. As might be expected, farmers and manual laborers were most frequently attacked. The point of entrance and the type of wound were also noted, and in the majority of cases were found to be lacerations, although the highest percentage of mortality occurred in puncture wounds. Four postoperative, 1 neonatal, and 1 vaccination case were also reported. The incubation period was observed to vary widely from two to twenty seven days, with an average interval of eight days. The period elapsing between the onset of the symptoms and the beginning of treatment also varied, 36 of 50 cases receiving serum on or before the fourth day. In contrast to figures quoted by other investigators, which ran as high as from 70 to 90 per cent, the mortality in this series was found to be only 32 per cent.

The authors consider the aim of therapy to be threefold: (1) to arrest the elaboration of the fatal exotoxin at the point of inoculation, (2) to neutralize the circulating poison, (3) to liberate the nerve elements already involved from combination with the toxin. With these purposes in mind, serum has been given locally by infiltration and topical application intracerebrally, intraspinal, intramuscularly, subcutaneously, as well as into the carotid artery. Ciancarelli employed the intramuscular and the intraspinal routes. In an attempt to destroy the combination of the toxin with the nervous elements, serum has been given in combination with chloroform, urotropin, glucose, and ether, respectively. The value of these combinations has not yet been determined.

In the series here reported, the serum was given alone in heavy doses 00,000 unit were given immediately into the spinal canal, followed by 00,000 or even 200,000 units given intramuscularly the dose being repeated daily until remission of the symptoms occurred. Relief was usually observed in a day or two. In several of the patients slight serum sickness occurred, but in no single case did serious accident take place. On the basis of this experience the authors are led to believe that the prompt and liberal use of specific serum is the best form of treatment for tetanus.

LEITH FARAN, ORTH, M.D.

ANESTHESIA

Guthrie D. and Woodhouse E. W. Safety Factors of Ethylene Anesthesia. *J Am M Ass.*, 1920, 4, 945.

In August, 1914 the senior author instituted the use of ethylene as an anesthetic agent in the Robert Packer Hospital, Sayre, Pennsylvania. At first it was used cautiously and only occasionally but gradually because it proved its adaptability to most surgical cases, it has become the anesthetic of choice for the majority of operations. During the fifteen year period beginning August, 1914, ethylene has been given as the main anesthetic or for induction, supplemented by ether anesthesia, in 35,500 patients.

Based on this experience in which ethylene gas was used in whole or in part as the anesthetic agent, it is the authors belief that ethylene is an excellent anesthetic for general surgical use.

The induction of ethylene is rapid, smooth, and more pleasant than that of the most common inhalation anesthetics. The respirations are quiet and

regular, the skin is dry and the color is good while the patient is under the anesthetic. Muscular relaxation is excellent and adequate for all general or orthopedic surgical needs. The effect of the anesthetic on the blood pressure is slight. Postoperative nausea, vomiting, and distention are minimal.

For general usage, the authors believe that ethylene is an anesthetic agent which is superior to either nitrous oxide or spinal anesthetics and, from the standpoint of explosibility safer than cyclopropane.

The disadvantages of ethylene are few. The main objection to its use has been its explosibility. This objection has been emphasized out of proportion to its merit. There have been no explosions in the authors' experience with this anesthetic.

The avoidance of explosions requires strict adherence to a few rules. No flame must be allowed in the operating room. Static sparks must be avoided by the use of modern gas machine and the maintenance of humidity of 50 per cent or higher. The use of an intercompleting unit is advocated.

Pulmonary complications and postoperative phlebitis or severe back have been infrequent among the patients who have been operated upon under ethylene anesthesia in this series. The incidence of these complications has been lower than that reported for other anesthetic agents.

Fifteen immediate deaths occurred in this series, 3 of which may have been due to ethylene. This represents an immediate mortality of 1 in 17,750 ad ministrations.

The authors express the opinion that ethylene is an excellent anesthetic agent for general surgical use and that an unjust prejudice exists in the minds of the surgical profession with respect to its widely heralded disadvantages. SUMNER H. KIRK, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Fossati, F. **Hernias, Diverticula, and Sacculated Exudates of the Pericardium. Symptomatology and Differential Radiological Diagnosis** (Ernie, diverticoli ed essudati saccati del pericardio sintomatologie e diagnosi differenziale radiologica) *Radiol med*, 1940, 27 343

Hernias and diverticula of the pericardium deserve to be studied more extensively from the standpoint of radiology, since the clinical manifestations cannot be properly interpreted without x-ray studies, and the latter must differentiate between other conditions of the heart and mediastinum. These conditions remained unknown for a long time, and it remained for two roentgenologists, Kienboeck and Weiss, to describe them accurately in 1929. At present we are in the phase of systematizing our knowledge of the subject and differentiating it from the complex group of pericardiomediastinal conditions. In 1935 Rizzi reported on the pathological anatomy. Diverticula of the pericardium are circumscribed extroflexions, sac-like in shape, of the pericardium, generally containing fluid, and communicating through a meatus with the general pericardial cavity. There are two types, those consisting of the entire wall of the pericardium (genuine diverticulum) and those involving only the serosa (hernia of the serosa). Diverticula proper are congenital in origin. Inflammatory changes found here are usually secondary. The hernias of the serosa are almost always acquired through pleuropericardial adhesions.



Fig 1 Right pericardial diverticulum



Fig 2 Left pericardial diverticulum

In 70 per cent of the cases pericardial diverticula and herniations occur on the right side of the heart. The form is round or ovoid. The volume is variable from the size of a nut to the size of a large orange. Only diverticula of a certain volume can produce clinical and radiological findings, the others are merely anatomical curiosities. The contained liquid is usually clear in the congenital cases and cloudy in the inflammatory cases. This liquid causes the density of the x-ray shadow in pericardial diverticula and hernias. Histological study in inflammatory types shows tuberculosis, syphilis, rheumatic infection, and pneumonia. In chronic inflammation parietal calcification is observed. In exceptional cases fistulas may open on the anterior thorax.

Subjectively the patients complain of precordial oppression, palpitation, pain radiating to the shoulder, asthenia, dyspnea, dry cough, anorexia, headache, and mild fever. Objective findings are scarce, there is dullness over the region of the diverticulum. The heart sounds and the electrocardiogram are normal. The clinical course is protracted and the prognosis as to life is good. Death usually results from intercurrent maladies.

Radiologically the visibility depends on the volume. The form is usually semi-oval or semi-circular. As to location 73 per cent occur on the right margin,

4 per cent on the anterior wall, 1 per cent on the left margin, and 1 per cent on the posterior wall. The author presents various illustrations of diverticula in various situations associated with respiration (inspiration and expiration) as well as kymographic tracings of the pulsating diverticulum. The neighboring lung tissue is usually not affected unless there is an inflammatory reaction in the diverticulum. The heart, aorta, esophagus and trachea are usually not affected. The differential diagnosis must exclude pericardial aneurysm of the heart, tumors of the heart, persistence of the duct of Botalli, echinococcus cyst of the myocardium. Also to be excluded are tumors of the pericardium (lymphangioma, hemangioma, lipoma, sarcoma) and trapericardial aneurysm of the ascending branch of the aorta must be considered, also affections of the mediastinum such as lymphogranuloma and lymphosarcoma, benign tumors of the mediastinum, dermoid cysts, and calcified pleuritis. The author presents numerous illustrations and helpful bibliography on the subject.

JACOB E. KURZ, M.D.

Brull, L., Van Pra, P., et Dumont, P. Immediate and Late Results of Irradiation Therapy of 100 Cases of Toxic Goiter (Résultats proches et éloignés de la radiothérapie de cent cas de goitres toxiques). *Rev. belge d'ot. ind.* 1940, 33.

The authors present their experience during a period of ten years with irradiation therapy of toxic goiter. In their choice of cases for this type of therapy they exclude nodular goiters which are too large or too hard and those goiters producing scoliosis or tracheal compression.

They emphasize the importance of the preparation of the patient. Irradiation should not be employed until after the patient has received adequate medical treatment. This preparation consists of placing the patient at rest permitting practically no visit, a adequate diet with exclusion of coffee, tobacco, and alcohol and the use of Legal's solution and barbiturates. This preparation may require one week or several weeks, but irradiation is not begun until the patient's general condition has improved,

weight loss has stopped, pulse rate has decreased, and gastro-intestinal irritability has diminished.

The radiation is produced by difference in potential of 200 kv. filtered by 1 mm. of copper and 1 mm. of aluminum at a distance of 40 cm. and an intensity of 4 ma. The dosage in the majority of cases, applied biweekly is from 50 to 300 international roentgen units. However in some cases it may be preferable to use smaller doses of 75 to 100. Usually three series of treatments of four weeks are given with intervals of six weeks of rest.

As regards the results of this form of treatment, the authors present their experience in two series of cases. The first series comprising 46 cases showed before treatment median eight and pulse rate of 100 and a median basal metabolic rate of +37. These respective figures following treatment were 60, 88, and +7. Of the 46 patients, 33 returned to normal life, 3 died, 8 presented failures or incomplete recoveries, and one could not be traced. In the second series of 54 cases, before irradiation therapy the median eight, pulse rate and metabolic rate were 81, 12, and +30, respectively. Following treatment these corresponding figures were 56, 90, and +3. Of these 54 patients, 4 returned to normal life, 7 were benefited, and 6 were not benefited.

The late results in the first series are based upon 3 of the 46 patients examined from 6 to 20 years after treatment. It was found that before treatment the median eight and pulse rate were 5 and 7 respectively whereas these corresponding figures were 65 and 86 after treatment. Only 3 patients continued to have cardiac disturbances. The 13 others revealed no evidence of hyperthyroidism although 7 had evidence of hypothyroidism.

The authors admit that irradiation may precipitate a thyroid crisis and lead to death. They report 3 fatal cases as examples. In this connection they emphasize again the necessity of adequate preparation before treatment is begun. At the end of the article, they present in tabulated form their 100 cases treated by irradiation.

MICHAEL DEBERRY, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Leveuf, J. Traumatic Shock (Le choc traumatique)
J de chir, 1940, 55 403

Leveuf points out that the reality of traumatic shock is clearly recognized, especially in the wounded in war, but that its true cause and the mechanism of its production are not yet understood. The essential factor in traumatic shock is the circulatory collapse, involving the peripheral circulation especially. From his analysis of the chief characteristics of traumatic shock, the author comes to the conclusion that it represents a disturbance of the vagosympathetic equilibrium, resulting from a reflex irritation originating at the traumatized site and transmitted by the nervous system. If the resulting damage to the vegetative nervous centers is irreversible, the shock is necessarily fatal. Such fatal shock is most apt to occur in persons who are definitely vagotonic and thus especially predisposed to circulatory collapse.

On the basis of this theory, Leveuf makes certain suggestions in regard to the treatment of traumatic shock. Since it is evident that traumatic shock does not develop at once following the trauma but becomes increasingly severe until the nerve centers may be permanently injured, it is important that the wounded be treated as promptly as possible. Injured persons should be kept warm, and the anoxemia should be treated by inhalation of oxygen in an oxygen tent. Treatment for the circulatory collapse is especially important. Since the vasomotor disturbance involves the peripheral capillaries primarily and the heart only secondarily, measures designed to strengthen the heart are not primarily indicated. This refers not only to the use of cardiac tonics, but also to the intravenous injection of large amounts of serum or large blood transfusions with a view to raising the blood pressure rapidly. The experience of the last war showed that such large injections or transfusions are ineffective and sometimes harmful. Injections of small amounts of hypertonic solutions, such as hypertonic saline or glucose solution, are better, as their osmotic property tends to withdraw fluids from the tissues into the capillaries. Small amounts of blood should also be used for transfusion. Drugs should be used to reduce the vagotonia and stimulate the sympathetic system. To reduce the vagotonia, small doses of atropine are indicated, to stimulate the sympathetic system, adrenaline and less toxic homologues, such as ephedrine, are used. Adrenaline must be employed with care, as its action is of short duration. The use of adrenaline may appear contraindicated because it is a vasoconstrictor, but if the theory of the vasomotor disturbance in traumatic shock is correct, its stimulating action on the sympathetic is of greater importance. In addition, drugs should be used which improve the

peripheral circulation, without direct action on the nervous system, for instance, the antispasmodics such as papaverine. Also drugs that act on the vasomotor centers are indicated, of these camphor is best known and is much used by surgeons. The action of camphor in oil is slow, however, for a more rapid effect coramine or cardiazol should be used. As acidosis is a constant factor in shock, bicarbonate of soda should be given in doses of from 8 to 10 gm daily, by mouth. All these measures should be employed before the necessary surgical procedures are undertaken.

The experience of the last war proved the value of the wide excision of injured muscular tissue in arresting the progress of shock. The question of anesthesia in cases of traumatic shock is one of importance and should receive further study. All the methods of treatment suggested should be employed with care and under close observation, with special attention to changes in the blood pressure.

Alice M. Meyers.

Kendrick, D. B., Jr., Essex, H. E., and Helmholz, H. F., Jr. An Investigation of Traumatic Shock Bearing on the Toxemia Theory. *Surgery*, 1940, 7 753

By means of heart and lung preparations, the hind limbs of dogs have been perfused, and the effect, on recipients, of blood from perfused unaffected and traumatized limbs has been observed. While 100 ccm of blood from the perfused limbs was being given to the recipient, an equal quantity was withdrawn, defibrinated, and added to the blood reservoir of the heart-lung limb preparation. As many as 23 exchanges of blood were made during the course of the experiments, which ran from two hours and twenty minutes to four hours and twenty-five minutes.

Blood from unaffected limbs, or from limbs traumatized for short periods, did not produce shock in the recipients as determined by the blood pressure and the concentration of hemoglobin during the period of observation. However, one animal died in eight hours and another in eighteen hours after the experiments were completed. Blood from limbs traumatized for from thirty-five to forty minutes caused a significant decrease in the blood pressure within forty minutes after the first exchange of blood, and death occurred a few hours thereafter. Repeated removal, defibrination, and reinjection of a dog's own blood was without effect on the blood pressure and the animal treated in this manner fully recovered.

The bearing of anesthesia and certain other factors on the results has been discussed. It is concluded that the results of the experiments described in this report furnish suggestive, but not conclusive, evidence for the toxemia theory of shock.

Macpherson, A. I. R., McCull, M. E., and Hamill, W. F. T. The Effect of Intrapartum and Neonatal Administration of Synthetic Vitamin K Analogues on the Newborn. *Brit M J* 1940 3:30

The discovery of Vitamin K and of its relation to plasma prothrombin, and the recognition of prothrombin deficiency as an important cause of hemorrhage in man suggested a new approach to the problem of the hemorrhagic tendency in the newborn. In normal infants the prothrombin index at birth is usually about 60 per cent and may fall in the first three days of life to dangerously low levels. Thereafter it rises spontaneously to 70 to 80 per cent and is maintained at that level for some months. Estimations made of babies born after abnormal labor or of mothers suffering from severe toxemia suggest that the type of delivery and the antenatal condition are factors which influence the prothrombin level in the newborn. When synthetic Vitamin K is given to the baby after birth the prothrombin index rises to and remains within normal limits. A similar result has been obtained by the use of natural Vitamin K. The reserve of prothrombin or of Vitamin K is not adequate to maintain the prothrombin level in the newborn until the time when Vitamin K is absorbed in sufficient quantities from the alimentary canal. In the adult intestine Vitamin K is absorbed directly from the food in the presence of bile and from the colon, where Vitamin K may be synthesized by bacterial action.

Milk is a poor source of Vitamin K and in the newborn the contents of the intestine are sterile. Hence it has been assumed that enough Vitamin K cannot be absorbed until bacterial invasion of the bowel occurs. Breast feeding or the use of unsterilized breast milk on the first day should assist this synthesis by supplying numerous harmless bacteria, but it does not afford any protection against the fall in plasma prothrombin. Other facts also may be involved. It is not known, for instance, whether the composition of bile in the newborn is suitable for the optimal absorption of Vitamin K. Jaundice and prothrombin deficiency do not necessarily coexist. That icterus simplex neonatorum is due to excessive hemolysis and that neonatal immaturity of the liver suggests that deficient synthesis may also be a factor in neonatal hypoprothrombinemia.

Prevention of prothrombin deficiency will decrease the incidence and severity of complications in the newborn. In most normal babies early breast-feeding will prevent abnormal or prolonged falling of the plasma prothrombin. The default administration of Vitamin K analogue to the mother less than twenty-four hours before delivery leads to a rapid absorption into the fetal circulation and appears to supply stores of Vitamin K sufficient not only to raise to normal limits the prothrombin content of the baby's blood at birth but to maintain it within normal limits during the early days of life.

A similar effect after birth with complete absence of any untoward reactions is obtained when the

Vitamin K analogue is given in the first few hours of life. Injection of the naphthoquinone gives a speed of action comparable to that of blood transfusion and its effect seems to be more lasting. All these facts suggest that the administration of a Vitamin K analogue either to the mother between twelve and four hours before delivery or to the newborn, would appear to be especially indicated (1) in cases of maternal toxemia (2) in premature labor (3) in cases of difficult or instrumental delivery (4) when breast feeding is not possible (5) when any cerebral symptoms develop during the first day of life (6) in cases of hemorrhagic diathesis, icterus gravis neonatorum and anemia and (7) when an operation is necessary on the newborn.

M. C. E. LAMBERT, M.D.

Fridericia, L. S., Goddard, S., Vintrop, W., Clemmensen, S., and Clemmensen, J. Stomach Lesions in Rats Kept on Diet Deficient in Vitamin A. *Am J Cancer* 1940, 30:8

In four series of experiments, 114 rats were subjected, intermittently or continuously to diet deficient in Vitamin A. Seventy-four rats on a normal diet served as controls. Eighty per cent of the experimental animals showed progressive changes in the mucosal lining of the stomach, while 13 per cent of the controls had similar lesions. The relationship to malignancy is discussed.

PAUL STARR, M.D.

Petri, S., Nørgaard, F. and Bandier, E. Studies on the Causation of Experimental Gastrointestinal Proliferation. *Acta Med Scand.* 1940, 3:34

Light pigs (Danish swine) were gastrectomized at the age of seven weeks. The effect of this operation was arrest of growth, emaciation, changes in the skin, hypothermia, anemia, and central nervous system degeneration. Nicotinic acid in large amounts did not prevent these changes. The work is well illustrated.

PAUL STARR, M.D.

Ward, G. E., and Corington, E. E. Hemangiomas of the Skin. *J Am M Ass.* 1940, 4:869

The authors report in this article their observations and results of present-day methods of therapy in the treatment of 94 consecutive cases of superficial hemangiomas representing 77 lesions.

Every area patient with hemangioma of the skin who comes to the Oncology Clinic of the School of Medicine of the University of Maryland is seen by a radiologist and a surgeon for unbiased opinion on the proper therapy. In discussing the results the authors consider (1) all forms of therapy whether used alone or combined. Radium therapy is becoming more and more popular throughout the world, particularly in tumor clinics, and this is by far the most common form of treatment.

The results are classified as (1) good, (2) satisfactory and (3) poor.

By good result from radiation therapy is meant the entire disappearance of the tumor with

no disfiguring patches of hemangioma, scarring, telangiectasis, atrophy, loss of hair, increased pigmentation, epiphyseal injury, or other residuals. It is to be remembered that some slight scarring remains after any form of therapy, but the authors' definition of a good result is one in which the amount of scarring is no more noticeable than the fine linear scar following surgical excision. In this series of 94 cases, all of which were superficial, 40 per cent of the results were considered good. The best results were obtained in infants less than two years of age. After the period of infancy, the good results of irradiation decreased in direct proportion to age.

2 The results were satisfactory in 47 per cent of the cases. In this group also the end-results are compared with what might have been accomplished by surgical excision. The reason for this comparison is that surgical excision is the older form of treatment for hemangiomas. Included in this satisfactory group are all cases in which there is a slight or moderate amount of scarring or telangiectasis, or in which small patches of tumor remain, also cases in which the tumor is entirely gone but the cosmetic result is only satisfactory. In this group too are placed many of the larger hemangiomas, especially of the face where surgical treatment was out of the question because of the size of the growth or extensive involvement of eyelids, lips, or nose. There has been tremendous improvement in many of these cases, but obviously not a "good" result. In many of these cases the pronounced scarring will improve with age, and ultimately give a more satisfactory result.

3 In the group yielding poor results (13 per cent in this series) are included (1) all port-wine stains (53 per cent), which are all radioresistant, (2) most hemangiomas in adults which were radioresistant and which were finally treated with electrosurgery or surgical excision, and (3) all cases in which the residuals, such as patches of tumor, telangiectasis, atrophy, or loss of hair, were so pronounced that the cosmetic result was considered bad.

There are many who think that primary excision of hemangiomas without previous irradiation is the treatment of choice. They argue that time and expense will be saved by primary excision and that a cosmetic result equal to or better than that obtained by irradiation will follow. The authors contend that irradiation gives good or satisfactory results in a high percentage of cases (87 per cent in this series) and therefore that surgical treatment is unnecessary for the majority of hemangiomas. In many cases of failure of irradiation, surgical excision gives the same linear scar that primary excision would have given. The cavernous growths that have to be excised surgically are much less vascular and operation is safer if pre-operative irradiation has been given.

It is the authors' opinion that as a general rule radium gives good results in a large percentage of cases of superficial hemangioma. A fairly extensive review of the literature on hemangiomas reveals that

most articles deal with case reports of unusual types, successful cures by various methods of therapy advocated by many authors, and general discussions on the pathology of hemangiomas, but there was not much emphasis on the failures, complications, and late residual effects of irradiation. The patients with bad results are commonly seen by plastic surgeons and do not return to the irradiation therapist unless carefully followed.

Radium is of greatest value in capillary and cavernous hemangiomas in young infants. Cavernous hemangiomas are treated best by external radium and, after several months, by interstitial electrocoagulation for the residual growth. External radium is by far the best and gives the most equally diffuse sclerosing effect of any of the sclerosing agents. Irradiation has given poor results in port-wine stains.

Solid carbon dioxide is used for very small hemangiomas, residual patches of hemangioma, telangiectasis around the periphery of a lesion previously treated by irradiation, hemangiomas around the eyelids, and hemangiomas of the scrotum.

Good results can usually be obtained in superficial hemangiomas, but only when the surgeon understands the indications, contraindications, and limitations of all forms of treatment, including radium and roentgen therapy, the principles of good plastic surgery, and electrosurgery. It is certain that a working knowledge of only one type of therapy will not give good results in all types of superficial hemangiomas. SAMUEL H. KLEIN, M.D.

Seed, L., Slaughter, D. P., and Limarzi, L. R. The Effect of Colchicina on Human Carcinoma Surgery, 1940, 7: 696.

Investigations of the effect of colchicina as a mitotic poison began with the observation of Amoroso, who noted that in patients who had gout and carcinoma and were treated with colchicina and irradiation simultaneously the tumors regressed more rapidly than usual. After this observation, Ludford found that colchicina added to tissue cultures in dilutions of from 1:500,000 to 1:100,000,000 caused an increase in the number of mitotic figures, which resulted primarily from the accumulation of arrested mitosis rather than from the stimulation of mitosis.

If colchicina stops the division of cells in metaphase, such an effect would appear to be useful in the treatment of malignancies by irradiation. If irradiation is more destructive to dividing cells, and if the division of cells could be even temporarily stopped by colchicina poisoning, the effect of the radiation might be increased. The more rapidly growing cells are more susceptible to colchicina poisoning. On this basis the authors decided to try the combined effect of irradiation and colchicina on human carcinoma.

Colchicina was given in toxic doses to 4 patients with advanced carcinoma. Two of these died of colchicina poisoning, which was accompanied by fever and by severe agranulocytic leucopenia, anemia, and

tendency to bleed, evidence of suppression of all the blood-forming elements. In the other patient there was histological evidence of degeneration in the tumors within a few days and gross evidence of longling and absorption within a few weeks. In both patients the tumors, after the primary regression, began to grow at an accelerated rate.

JOSEPH K. NAR. M.D.

Ilintze, A. Results of Cancer Irradiation for Twenty-Five Years; 188 Five-Year Cures, 1,044 Free of Symptoms (Bestrahlungserfolge beim Krebs aus 5 Jahren. 80 Fünfjahrige. 1044 Symptomfrei.) *Strahlentherapie*, 9:39, 66, 89.

There were two phases to this study: (1) experimental irradiation and irradiation for inoperable conditions and (2) irradiation therapy by choice, for primary conditions or for recurrence. In this phase of our work it was soon found that cutaneous and mucosal cancer accessible from the surface, could be brought to cure. The author's own material comprised 5,033 patients treated at the Bier clinic during the period from 1911 to 1937. Of these, 89 were treated exclusively by operation and 3,197 by irradiation, or by irradiation and operation combined. Most cases were given treatment with roentgen-rays only; a small number were treated with radium or with a combination of the two.

The material may be classified into 306 skin cancers, 99 cancers of the mammary gland, 973 cancers of the mucosa, and 709 cases of sarcoma. One thousand and four of the patients are free of symptoms after five or more years. Roentgen treatment has developed progressively: of the 5,033 patients treated, 3,579 were operated upon and only 604 were irradiated prophylactically after operation. In 509 cases irradiation was primary and this in

number of instances was followed by operation. Of the 973 patients operated upon primarily and not irradiated prophylactically, 1,034 were later given irradiation for recurrence. Therefore, of the 5,033 cases under treatment only 89, i.e. about three per cent, were treated exclusively by operation. Of the 5,033 patients, 737 or 36 per cent, are still living after five years. Of these however only 557 were treated exclusively by operation, while 80 were cured by exclusive irradiation, or by irradiation combined with operation. Therefore it can be seen that the five-year results and permanent cures were usually obtained in cases in which exclusive irradiation or irradiation combined with operation was employed.

Of the 3,197 irradiated patients, 80, or 37 per cent, are living after five years, and 736 or 31 per cent, are free of symptoms after five (to twenty-five) years. The patients with cutaneous-cancer cases presented the most favorable results, with 65 per cent living and 43 per cent symptom-free; the next most favorable results were presented by patients with cancer of the breast, with 36 per cent living and 20 per cent symptom free, and last were those with sarcoma with 33 per cent living and 26

per cent free of symptoms. These figures for cure are especially noteworthy in that they include all the inoperable patients. Only the patient with mucosal cancers presented poor results with 9 per cent living, and 0 per cent free of symptoms. When those who died of intercurrent affection but who were free of symptoms for from one to five years and those who were treated in the period from 1934 to 1937 and are living and free of symptoms, or who are dead of intercurrent disease after a period of observation of from one to five years are included, a total of 1,004 irradiated patients who are free of symptoms (of course not all with the observation period of five years) is obtained.

A table is appended showing the four groups from which it is seen that the greatest part of the 80 cases include the group of exclusively irradiated cases (445); next is the group of recurrent-irradiated cases (368); in third place the operated and subsequently prophylactically irradiated cases (361); and last the irradiated and then subsequently operated cases (8). In the individual groups it is seen that in the cutaneous cancers, the sarcoma and the mucosal cancers the best results are obtained by exclusive irradiation, and in the breast cancers, by primary operation with subsequent prophylactic irradiation. It is further observed, that in each of the four groups the cases irradiated for recurrence occupy second place. From this it is ascertained that irradiation of the patient with recurrence shortens the length of life, however freedom from symptoms may be no longer attainable. Since recurrence is the rule even after the best of operations in cases of cancer of the skin, all patients who are operated upon must be prophylactically irradiated. However in these cases exclusive irradiation without operation is fully justified also.

The author states that while Koenig reported at the Surgical Congress 3,000 exclusively operated cases from 3 German clinics, which had been free from symptoms for five years, he offers, from radiological institutes and 8 irradiating gynecological institutes, approximately 4,000 cases free from symptoms for five or more years; these had been irradiated exclusively or had been given combined treatment. He then goes on to state that at the clinic for women in Tuebingen, for example, the transition has been made from operative treatment to treatment by irradiation exclusively.

The results within the individual groups are portrayed in five tables, which may be consulted in the original article. (F. W.) JOHN W. BURNETT, M.D.

Fildes, P. A Rational Approach to Research in Chemotherapy. *Lancet* 9:40, 38, 955.

An essential metabolite is a substance or chemical group which takes an essential part in the chain of syntheses necessary for bacterial growth. A "growth factor" which must be supplied in the nutrient is an essential metabolite which the cell cannot synthesize. Nicotinic acid is an essential metabolite for all bacteria, but a growth factor for only a few.

Anti-bacterial substances function by "interfering" with an essential metabolite and thus inhibit growth. The interference may be

1 By oxidation of a substance which requires reduction

2 By molecular combination, forming an inactive product

3 By competition for an enzyme associated with the essential metabolite

It is claimed that sulfanilamide acts as in "3," the essential metabolite being p aminobenzoic acid. Class 3 inhibitions require an inhibitor so closely related in formula to the essential metabolite that it can fit the same enzyme, and sufficiently unrelated to be devoid of essential metabolic activity.

It is suggested that research in chemotherapy might reasonably be directed to making such modifications of known essential metabolites that they will have these characteristics.

SAMUEL KAHN, M D

McClure, R D., and Lam, C R. Experiences in Heparin Administration. *J Am M Ass*, 1940, 114: 2085

The authors present their results with heparin administration in a series of 11 cases. They believe that their patients presented definite if not urgent indications for heparinization.

The dose consists of 10,000 units of heparin dissolved in 10 c cm of saline solution. (This unit is five times larger than the original Howell unit, which inhibits the clotting of 1 c cm of cat's blood.)

The details of treatment as followed by the authors are as follows:

It is convenient to give the heparin in 2 per cent solution, but if there is an indication to restrict fluids more concentrated solutions may be used. In

1 case there was no ill effect from repeated injections of the undiluted solution. When the continuous intravenous drip method is used, the vein selected may be in the leg or arm. It is more convenient for the patient if the needle be in the leg, as this leaves both arms free for eating, reading, and personal care. In most instances a medium sized intravenous needle is inserted into the vein and taped firmly in place, without the necessity of "cutting down." The leg is not splinted, on the contrary, after a day or two the patient is encouraged to move all the extremities at will. In an uncooperative patient, such as the man with tabetic dementia paralytica in our series, it is essential to fasten a cannula in the vein by ligature. When the patient has recovered sufficiently from his operation or infarction to be ambulatory, the needle may be transferred to a vein in the forearm, after which he may sit in a chair or walk about the room with the intravenous injection running. How long the patient should be ambulatory before the heparin is discontinued is not known, two days should be a reasonable period.

The 11 cases treated with heparin by the continuous intravenous drip method are summarized in Table I.

The potency of heparin obtained from different laboratories may vary markedly. This fact, together with the fact that there is no official standard of potency, causes confusion when results are compared. The unit referred to in this paper is that of the Toronto workers, namely the activity of 0.01 mgm of the crystalline substance. Best believes that the potency of this product is perfectly constant. There is, however, considerable variation in the amounts required for different patients.

In general, the potency *in vivo* has not been as great as the authors had expected after reading the

TABLE I—SUMMARY OF 11 CASES TREATED WITH HEPARIN BY THE CONTINUOUS INTRAVENOUS DRIP METHOD

No	Patient	Age	Sex	Weight	Operation or diagnosis	Indication for heparin	Evidence of pulmonary embolism				Days of heparin	Approximate units per hour necessary	Total number 10 c.cm vials	Chills
							Typical history	Physical signs	Hemoptysis	X ray evidence				
1	W P	25	♂	191	Hernia	Embolism	+	+	+	+	6	2 000	20	3
2	B S	49	♀	157	Hernia phlebitis	Embolism	+	+	+	+	15	1 000	40	4
3	N V	24	♂	154	Fractures	Embolism	+	+	+	?	10	2 000	40	2
4	S K.	37	♂	180	Perforated appendix	Embolism	+	+	+	+	9	2 000	40	1
5	E S	45	♀	161	Ovarian cyst	Embolism	+	+	0	0	5	1 000	11	1
6	M S	52	♂	152	Hernia	Embolism	+	+	0	?	6	1 500	20	1
7	G L	62	♂	117	Popliteal embolus	Embolectomy	—	—	—	—	5	2 000	26	0
8	A R	45	♂	174	Hernia	Embolism	+	?	0	+	9	1 000	17	0
9	F M	42	♂	210	Pleuritis	Phlebitis	—	—	—	—	6	2 000	18	0
10	J M	35	♂	152	Tabetic dementia paralytica	Thrombosis of artery	—	—	—	—	2	2 000	11	0
11	W K.	60	♂	187	Prostatectomy	Embolism	+	+	0	+	8	2 000	38	0

previous reports. As indicated in the table 7 patients required approximately 1,000 units an hour to keep the clotting time above fifteen minutes required 1,500 units, and 3 required 2,000 units. The females in the series are in the last group. The eight of the patients are not significant. Chills and fever the only toxic effect observed, occurred in the earlier cases, but no such effects are noted in the last 3 consecutive cases. The price of heparin has come down appreciably since the others began using it. The daily cost may not exceed \$ 0 or \$ 5, which is no more than the amount paid for special nursing care.

SAMUEL H. KATZ, M.D.

DUCTLESS GLANDS

Desautels, A. The Problem of an Internal Secretion of the Skin (Le problème de la sécrétion interne cutanée) *Presse méd. Par.* 940, 48 4

Desautels states that clinical and experimental findings show that excitation of a considerable area of skin produces normal physiological cutaneous reaction without structural change, which is characterized by the liberation of certain chemical substances in epidermic and dermic tissues that are discharged into the circulation and thus affect distant organs. These substances are not true cutaneous hormones, as they are not specific for the skin but are also produced in other tissues. Certain types of radiation liberate estrogenic substances

from the cutaneous tissues which are also discharged into the circulation.

A number of investigators have carried out experiments with cutaneous extracts of the skin. Japanese investigators, who consider that the tip of the rabbit ear is typical skin tissue, have obtained a substance that they call epophyllaxine from this tissue by perfusion. Very similar effects have been obtained by stimulation of large areas of the skin and by the injections of an aqueous cutaneous extract or of epophyllaxine. By either of these methods, infections of various types are inhibited, the basal metabolism is increased (by stimulation of the thyroid) the sympathetic system is stimulated and the blood sugar is reduced.

The author has prepared a lipid extract of the skin (pig skin). In one experiment on rats, in which large doses of this extract were given, no definite effect on the endocrines as noted hemorrhagic lesions in the liver and kidneys resulted, and there were marked changes in the epidermis with increase in cellular mitosis and lesions of parakeratosis. In another series of experiments on rats in which small doses of this extract were used, the animals showed a gain in weight and vitality increase in the size of the thymus, and diminution in the magnesium and especially in the calcium content of the skin. The diminution of calcium in the skin indicates the development of increased excitability which probably explains the cutaneous lesions produced by the larger doses.

ALICE M. METZKE

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POSTOPERATIVE INFECTIONS

FRANK L. MELENEY, M.D., F.A.C.S., New York, New York—Presiding

Collaborators: MARTIN B. TINKER, M.D., F.A.C.S., Ithaca, New York, J. STAIGE DAVIS, M.D., F.A.C.S., Baltimore, Maryland, CORNELIUS J. KRAISSL, M.D., New York, New York, CHAMP LYONS, M.D., Boston, Massachusetts, JOHN S. LOCKWOOD, M.D., Philadelphia, Pennsylvania

INTRODUCTION

WHEN a patient is subjected to an operative procedure, the barriers which normally serve to prevent the entrance of microorganisms into the body are temporarily let down and he becomes exposed to the danger of the organisms' gaining a foothold and causing an infection. The surgeon is responsible not only for exercising good judgment in determining upon the advisability of operation and the proper steps in the operative procedure but for minimizing the danger of postoperative complications, of which the most important is postoperative infection.

Before the days of Pasteur and Lister, surgery was limited in its scope chiefly because of postoperative infections, which inevitably occurred because of the entrance of microorganisms not only at the time of operation but at every subsequent dressing. Bacteria were transferred directly from patient to patient because of their close proximity in hospital wards, or indirectly through the medium of doctors and nurses and other ward attendants, who had no idea that they were responsible for the epidemics of pneumonia, hospital gangrene and erysipelas which customarily ran through the surgical wards of every hospital.

The modern surgeon knows nothing of this state of affairs unless he has taken the trouble to read the records of those who tried to practice

this art sixty or more years ago. Now, he takes it for granted that the hospital in which he works has taken all of the necessary precautions to minimize or prevent postoperative infections, and, if they develop, he is more than likely to put the responsibility on the hospital and absolve himself from all blame. It is perfectly true that the factors involved in postoperative infections are so multitudinous that any given case is seldom an individual responsibility. It is, after all, a group responsibility of the surgical personnel from the surgical chief to the junior interne, from the head nurse in the operating room to the youngest probationer, and from the hospital superintendent to the maids and orderlies. It is extremely important that each member of the staff should feel his or her own share in this group responsibility and by constant effort and meticulous care be certain that his or her share approaches the irreducible minimum. At the same time each member of the group must be on the alert to discover or apply new ways and means to constantly reduce the incidence of these infections in his own hospital.

The development of an infection within the human body depends upon the entrance of some microorganism into the tissues of the body, of sufficient virulence or in sufficient numbers or in such a state of animation that it is able to resist the lethal action of the local tissues or the cellular and humoral elements which are brought to the site through the blood stream. From numerous experiments it has been determined that in certain animals the introduction of a single virulent

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organs may result in the development of an infection and the death of the animal. On the other hand, the introduction of millions of less virulent organisms may produce no infection whatsoever. In some cases, the introduction of organisms may have to be accompanied by some damage to the local tissues such as contusion or by some lowering of the general vitality such as chilling or starvation would produce in order that an infection may develop. In short after an organism has gained entrance into the body whether or not an infection follows depends upon the outcome of the interaction between the virulence of the organism and the resistance of the host.

When a patient is operated upon he may be in perfectly normal health or he may be greatly debilitated either by a severe acute process or a prolonged chronic illness. At the time of operation, a wound is made and the tissues beneath the skin are exposed for a certain length of time. Certain conditions set up by the operator and his staff which are designed to minimize the entrance into that wound of microorganisms coming from a number of different sources. Briefly enumerated these sources are (1) the skin of the patient (2) the blood or lymph of the patient (3) the deeper tissues or cavities within the patient (4) the nose and throat of the operating personnel (5) the clothing, shoes, skin, and hair of the operating personnel (6) the hands, gloves, and gowns of the operating team (7) the instruments, sponges, compresses, pads, and suture material (8) the air of the operating room and all of the objects that are in the room or that are brought into the room during the operation and (9) the nose and throat, hair, skin, clothing and shoes of visitors.

Organisms from these sources may be introduced directly into the wound by objects which are primarily contaminated and are inserted into the wound, or they may fall into the wound from the air or on objects in the sterile field, which are then introduced into the wound. It seems to me to be extremely important to bear in mind these many sources of organisms and the various means by which they may get into a wound, particularly at this time when certain individuals are laying special emphasis on one factor in this complex problem to the exclusion of others.

However the operative wound is not the only part of the patient which is subjected to usual contamination. The extraneous organisms during or after an operation, nor is it the only region in which an infection may become established. During the period of pre-operative or postoperative

sedation or during the administration of the anesthetic, mouth organisms may get down into the trachea, bronchi, and bronchioles along with small particles of mucus or vomitus and, failing to be expelled because of the cessation of the cough reflex, may remain long enough to multiply and invade the adjacent epithelium, and thereby produce a lobular or lobar pneumonia or a lung abscess. The congestion and excessive secretion of the mucous membrane which results either directly or indirectly from the administration of the anesthetic may play a part in the establishment of the infection in this region. The unaccustomed bath, drafts in a large ward, excessive perspiration, and vasomotor disturbances of one sort or another are factors of secondary importance but must be considered in any complete discussion of this problem. The same factors play a role also in the development of postoperative sinusitis, tonsillitis, and parotitis.

Of major concern, also, are the infections of the urinary tract which not infrequently develop following an operation. A spasm of the urinary sphincter or an inhibition of the urinary reflex sometimes makes it impossible for the patient to void, and when all efforts fail, resort is made to a catheter. Various methods are used to minimize the introduction of organisms into the bladder but it is almost impossible to make catheterization a sterile procedure. With the body in a horizontal position, the bladder usually is not completely emptied and the retained organisms multiply in the residual urine and then irritate and later invade the mucous membrane of the bladder. Still later they may ascend to the kidneys and produce an infection of the pelvis or the later uterine tissues. A bladder which has become overdistended may be thereafter partially paralyzed, which increases the amount of residual urine. If the urine contaminated before or at the time of catheterization this must be kept in mind and the danger of overdistension weighed against the danger of further contamination by repeated catheterization. In any case spontaneous voiding is to be encouraged by all kinds of conservative measures, glycerin enemas being perhaps the most effective.

Infections of the lungs and liver from septic emboli of the venous or portal systems, respectively likewise fall into the group of postoperative infections which we have to consider. Aseptic emboli to the lungs which produce infarcts may be secondarily contaminated by aspirated mucus containing mouth organisms.

A recognition of these various sources of contamination is essential to a solution of the problem.

of postoperative infections. Gradually a knowledge has been acquired of ways and means to close the doors of these sources, to thus minimize the entrance of organisms into the body, to minimize the development of an infection by them, and to overcome any infections which develop in spite of all precautions.

I MINIMIZING CONTAMINATION

A FROM THE NOSE AND THROAT OF THE OPERATING PERSONNEL

J STAIGE DAVIS. When an observer goes to the operating room of another clinic, one of the first things that comes under his notice is the masking of the operator and the operating team, and from that he is able to judge, to some extent at least, the quality of the technique used in that operating room. If the operator or any of the team is inadequately masked, then with this as a definite break in technique, one is inclined to be somewhat skeptical about the rest of the protection for the patient, which cannot be so easily observed (4).

If one observes the methods of masking in various clinics and hospitals, it is astonishing what variations can be seen both in the types of masks themselves, and in the methods of using them. In the majority of hospitals, the masks are much too small and are therefore uncomfortable, they are too thin to be effective, and in addition are often worn improperly.

One frequently hears this remark: "I do not cover my nose, and do not intend to, as a mask is uncomfortable, my glasses become fogged and furthermore my infection rate is low." This, of course, is a stupid attitude to take, because few operators or members of operating teams know whether they are hemolytic streptococcus or staphylococcus carriers or not, and not one in these groups knows when he may become infected, especially in the winter epidemic season.

Meleney (20) found that 33 per cent of the operating personnel in a New York hospital, with no epidemic going on, harbored the hemolytic streptococcus, and almost all of it carried the staphylococcus aureus. Walker (29), in Boston, during two epidemics found that the streptococcus carriers in the operating personnel amounted to 50 and 58 per cent, respectively.

When we realize that microorganisms are constantly being showered from the unmasked nose or mouth into the wound during ordinary respiration, it is appalling to see an operator, inadequately masked, breathing into an open abdomen, an exposed brain, a wide-open breast defect, an

opened joint, or any other wound for say an hour or longer.

Let us consider these matters more in detail (1) ways and means to minimize the contamination of the wound at the time of operation (2) the ways and means to prevent the development of an infection by those organisms which get in, in spite of all of our precautions and (3) the methods of treating wound infections which develop.

It is my belief that every person who enters the operating room at any time should be properly masked. The chief surgeon and the head supervisor are just as liable to be hemolytic streptococcus or staphylococcus carriers as the orderly. When observers, either surgical or medical, are admitted to the operating floor, they should be as carefully masked and gowned as the operating team. I also believe strongly that adequate masking is particularly essential in out-patient departments for the operator and his assistants.

Now what is meant by adequate masking? The nose and mouth must be covered in such a way that organisms will be filtered out by the protective covering or deflected away from the sterile field. Four-ply gauze masks of unbleached muslin will filter out most of the droplets and dust particles which carry the great majority of the expired bacteria, but not those individual organisms or the fine dust suspended in the current of air. Smoke will go through these masks and so we must assume that bacteria will. The only certain barrier is an impermeable membrane of some kind—film, cellophane, or rubber—incorporated in or on either side of the mask. While such a layer does not permit the passage of bacteria, the bacteria are deflected around the sides by air currents. They do the least harm if they are deflected downward into the sterile gown. This can be accomplished for all practical purposes by a helmet covering the mask.

B FROM THE AIR

CORNELIUS J KRAISSL. The use of ultraviolet radiation as a bactericidal agent is not new but its value for the destruction of the organisms in the air of an operating room has been demonstrated only recently (7, 13, 32).

Our first studies were aimed to determine the zone in the ultraviolet spectrum which would be most bactericidal for the organisms commonly found in wound infections and which would cause the least unfavorable reaction to the tissues. This was found to be best obtained from a low pressure

mercury vapor tube designated as a monochromatic generator. Bactericidal determinations were made on plates seeded with the various organisms and compared with the bactericidal action on the same organisms when suspended in the air. It was found that it was from 6 to 10 times as easy to destroy bacteria in the air as it was when they were planted on the culture plates.

Loops of guinea pig's viscera were exposed for various periods of time and the intensity which produced adhesions in the succeeding week was recorded. A graph was plotted comparing the bactericidal effect on the seeded plate with the adhesion-producing effect on viscera, and it was found that the bactericidal effect for all of the wound-infecting organisms was always well within a safety zone in which adhesions would not be produced.

Studies were made on the bacterial content of the air of the various operating rooms and it was found that the rooms were relatively free when unoccupied but that the content quickly rose when patients, doctors, nurses, and others entered and began their activities.

It was also found that the predominating types of organisms were the staphylococcus albus and aureus which account for most postoperative wound infections. When we realize that the total number of organisms falling on the sterile field varies during an hour's time between 50,000 and 60,000 it seems that some attempt should be made to combat this contamination provided that no harm is done to the patient's tissues and that the inconvenience to the operating staff is not so great as to interfere with their efficiency or comfort.

The most important area in the room, when an operation is in progress, is immediately above the wound and is the one which should receive the greatest attention. A circular illuminating unit was therefore designed with an open top to reduce the heat and to permit a gentle updraft through the opening immediately above the operative site. A circular ultra-violet generator was applied to this unit so as to focus on the critical zone thus, bacteria entering this zone either by the exhaled air of the operators or by other operating-room air currents are exposed to the maximum intensity of radiation. Furthermore, they are drawn upward away from the wound and in all probability are destroyed by the intensity of the rays to which they are subjected. In addition, auxiliary wall units are so placed that the down-draft from the air conditioning supply is adequately radiated. The intensity of the combined radia-

tions has been carefully measured in every cubic foot of the operating room and so regulated that the amount can be tolerated by the tissues of the patient. The heads of the operating team being closer to the rays should be further protected by helmets, visors, and glasses to cover any exposed skin and thus prevent erythema. With this arrangement the bacterial colony count has been reduced to one-tenth of the original number. Data on wound healing are now being gathered on the cases operated upon under this radiation and figures should be available in another year or two.

C FROM THE HANDS OF THE OPERATORS

MARTIN B. TINKER. Scrubbing alone can make the hands bacteria free. This was demonstrated early by Lawson Tait (37) of Birmingham, England, and Schleich (35) of Berlin. Bacteriological tests on Cornell students under the direction of one of us (M. B. T.) have also demonstrated that hands smeared with spore-forming, resistant, non-pathogenic bacteria can be made bacteria-free. However scrubbing alone requires time, system, and thoroughness. Because of the time consumed (30 minutes minimum) the use of some reliable antiseptic following the scrub-up is desirable (33).

It is advisable to have a routine procedure which all shall follow in the preparation of their hands and arms. The nails should first be cleaned and cut. Scrubbing should be timed by a clock or hour glass but time is not more important than care, completeness, and vigor. The scrub should be systematic, beginning with the cleanest areas, the arms three inches above the elbow and working down the forearms to the hands—the backs, the palms, and the fingers, including the sides. The nails, especially underneath the free margin, should be given the most thorough attention with brush and orange stick. Sterile brushes should be used and they should have firm but not harsh bristles. Scrubbing should last not less than five nor more than ten minutes according to the vigor of scrubbing. Sterile liquid soap or as recommended by Walker (30) a coconut oil soap may be used. After scrubbing, which, if thorough, may remove the great majority of surface microorganisms, there seems to be considerable difference of opinion with regard to the use of a skin antiseptic. It has been demonstrated that it gives a wider margin of safety and we believe it should be employed. Price (3) in a recent study has shown the effectiveness of scrubbing and antiseptics in rendering hands and arms surgically clean.

As a hand disinfectant chlorinated lime and sodium carbonate paste has been found efficient.

Chlorinated solution in obstetrics was suggested nearly a hundred years ago by Holmes (9) and later by Semmelweis (26). For hand disinfection, a handful of each powder is taken up and they are mixed in the hands in a basin of sterile water. The hands and arms up to the elbows are covered with the mixture, which gives off chlorine gas rapidly. Care should be taken to get the mixture under the nails with an orange stick. Some of this may remain long after the operation. The arms and hands are then washed with a spray of or sponged with 70 per cent alcohol (by weight), then with 1:1,000 bichloride of mercury, and dried on a sterile towel.

Glove technique. Rubber gloves were introduced in surgery by William S. Halsted (6) and are now in almost universal use. Halsted's methods are still employed by his former students and assistants at Johns Hopkins Hospital. If rubber gloves are carefully cleaned after use, boiled and stored for one-half hour in an antiseptic solution which kills spores within that time or less, they may be considered safe for use, and will give service over a much longer time than if sterilized under steam pressure. Halsted used operating gloves much heavier than are generally found in operating rooms today. It is possible to feel well through a properly fitted glove even if it is of heavy or extra heavy weight. Gloves should be discarded as soon as the rubber loses its freshness and full elasticity, because older gloves of dead rubber puncture and tear too easily to be safe. The lighter weight gloves puncture altogether too easily. It is desirable to have the operating room nurse keep a record of the number of punctures that occur, and hold the members of the operating team responsible for punctures caused by careless or rough use. If such a practice is followed, the number reported each month, in the majority of operating rooms, will at first surprise the attending surgeons, and if the members of the operating team realize that their punctures are being checked, they will take greater care. A considerable number of minute punctures escape detection even by inspection of the most careful operating-room nurse. This is an important argument in favor of putting on gloves out of solution rather than dry, as is the practice in many operating rooms. It is surprising to see a tiny stream of water spurt from the finger of a glove when the glove is put on the hand, the puncture having been entirely overlooked in spite of the fact that the operating-room nurse had thoroughly distended each glove finger separately with water when inspecting. The number of such minute punctures which escape detection by the dry-glove method will probably average 1 or 2

per cent, at least. Such undetected punctures undoubtedly account for a number of mysterious infections which are so difficult to trace. Evident punctures or tears, either seen or felt, should be an indication for immediate change to freshly sterilized sound gloves.

FRANK L. MELENEY. Recently, glove manufacture has been improved so as to permit autoclaving without great damage. This makes the dry technique possible. For those who still prefer to use the dry-glove technique certain precautions should be observed. The hands should be dusted with sterile powder before the gown is put on so as to avoid contaminating the gown with powder which has touched the hands. The stockinette wrist band on the gown wipes off excess powder. The sterile nurse holds the gloves by the everted cuffs so that the surgeon may insert his hands directly into the glove without the possibility of contamination of the outside. The unsterile nurse who is the first to put on gloves should use gauntlets which can be donned without contamination from the hands—a thing which cannot be done with the newer gloves. After holding the doctor's gloves she may then discard the gauntlets and thinner gloves may be held for her.

D FROM THE SKIN OF THE PATIENT

MARTIN B. TINKER. Skin preparation mostly involves parts of the body ordinarily protected. Such skin is too sensitive to permit vigorous scrubbing with a brush. The first preparation is in the ward. The skin is shaved and then scrubbed with gauze sponges, frequently changed, saturated with liquid soap and water. This is followed by ether and alcohol. A protective aseptic dressing may then be applied. Repeated scrubs on three successive days, over a wide area, as specified by the Orthopedic Service of the United States Army during the World War, adds much to the safety of preparation, particularly if, as in most reconstruction surgery, the operative field has been previously infected. Chlorinated lime paste (United States Army, Orthopedic Service) is the best antiseptic for the patient's extremities, but is too harsh for the neck, chest, and abdomen of many patients. On the operating table the skin is rubbed with sponges soaked with alcohol and again with ether until the sponges come away without showing soiling. The scrub should begin along the lines of incision, each wipe of the sponge working toward the periphery in concentric strokes. Do not return from the outer unsterile area to the prepared area along the line of incision, but discard the sponge and begin with a fresh one.

The skin antiseptic is then applied. Various chemical substances have been advocated, which would seem to indicate that a perfectly satisfactory one has not yet been found. The chief difficulty seems to be that none of them can penetrate the pores sufficiently to kill the organisms there. The only reasonable test for the efficiency of a skin antiseptic is to determine the sterility of a piece of the full thickness of the skin at the line of incision. Such tests have not as yet revealed any antiseptic which will produce 100 per cent sterility.

Tincture of iodine is probably more generally used than any other antiseptic but it only gave from 55 to 86 per cent sterility. In several reported series of tests by American, English and German workers several years ago. The burning properties of iodine have led some surgeons to prefer certain other antiseptics, such as picric acid, mercurochrome, merthiolate, gentian violet, acriflavine and metaphep. Solutions of these substances in alcohol and acetone render them more penetrating and therefore more efficient. Five per cent creta line in 50 per cent alcohol and 10 per cent acetone was found to give the

best results in several series of experiments carried out under the direction of one of us (M. B. T.) a number of years ago at Cornell. Recently Walter (31) has advocated for skin preparation a mixture of coconut-oil derivatives, called zephiran, which is a detergent and is not only cleaning but antiseptic. The burning propensities of iodine may be largely obviated by complete evaporation and partial removal if the patient is red-headed or a very light blonde. Some writers report lowered antiseptic efficiency from this procedure. Certain watery solutions of iodine which are just as effective as the tincture and less irritating to the skin are now available. The perfect skin antiseptic however has not yet been found and in order to minimize contamination of the wound by organisms coming to the skin surface during the course of an operation towels should be clipped to the wound as soon as the incision has been made.

E. FROM THE SUPPOSEDLY STERILIZED MATERIALS

This phase of the problem is covered by the report of D. Elliott Cutler's panel discussion which appears on page 414 of this issue.

MINIMIZING THE DEVELOPMENT OF INFECTION IF THE WOUND BECOMES CONTAMINATED

A. MINIMAL TRAUMA

J. STANGE DAVIS. The gentle handling of all tissues is most important. It is interesting to observe the difference in the way in which surgeons handle tissues. One will use the greatest care and his work in consequence may be somewhat slower than the other. The other is heavy handed and shows little consideration for the tissues but does fast accurate work. The results, as far as infection is concerned, and also the final results are, as a rule, largely in favor of the man who has handled the tissues in a careful manner.

Sharp cutting instruments should be used in making incisions and dissections; retraction should be as gentle as possible and should not cause bruising; the crushing of masses of tissue when using artery clamps should be avoided; blotting rather than rough wiping with gauze sponges is to be preferred; aspiration should be used in place of sponging when possible; rough grasping of the skin and other tissues with thumb forceps is inadvisable and the thickness of the skin should never be grasped with an artery clamp. By the use of small sharp hooks and mosquito mouse-tooth thumb forceps, unnecessary bruising

of the skin and of the other tissues may be avoided.

Adequate hemostasis is also most important. The individual bleeding point should be picked up with as little of the surrounding tissue as possible. Vessels should be tied with fine silk in all clean cases. If there is any doubt as to the possibility of infection, then fine catgut should be employed.

As few ligatures as possible should be used. Checking the bleeding with the coagulating current is useful but care must be taken that as small an amount of tissue as possible is added to the healing spots of necrosis in the wound.

In addition to the gentle handling of tissues and thorough hemostasis, every care must be taken to conserve the maximum blood supply and nourishment of the tissues operated on. Incisions must be planned with that purpose in view and every effort should be made not to interfere with the nourishment of cells in the wound margins which function in the healing of the wound.

Too much tension must be avoided. If sutures, either buried or in the skin, are tied too tightly the circulation is interfered with and pressure necrosis occurs.

The material for skin sutures varies in different clinics, but this is not of very great importance because these sutures are usually removed. Catgut should not be used for skin sutures. Subcuticular catgut frequently becomes infected. It is better to use fine black waxed silk, horsehair fine wire, or fine silk worm gut. Horsehair, which is quite smooth and impervious, in addition has the facility of stretching slightly. When the wound edges become edematous and swell, as they always do to some degree and particularly when catgut is used in the deeper tissues rigid sutures do not stretch, and the points where they emerge from the skin undergo excess pressure for several hours at least, and often necrotic areas develop. On the other hand, when this swelling develops, the horsehair stretches and these necrotic areas are largely avoided. Dressings should be applied carefully and smoothly and should be comfortable.

The healing of all wounds is accelerated and infection is minimized by absolute immobilization and rest of the area operated on.

B MINIMAL IRRITATING FOREIGN BODIES INCLUDING SUTURE MATERIAL

1 STAGE DAVIS Before closing the wound, all clots, tissue fragments, and tags of tissue strangulated by ligatures should be removed as this devitalized material furnishes excellent pabulum for microorganisms. The removal of this detritus, and with it many air-borne bacteria, may be accomplished by flushing with normal salt solution. Excellent results are also obtained by the use of sterile soap and water solution in washing out clean operative wounds. For many years in my reconstructive work, ether has been used freely for this purpose and does not interfere with perprimam healing. The use of alcohol and of other coagulating antiseptics, such as bichloride of mercury in a 1:1000 solution in clean operative wounds or on any wound, should not be tolerated because much tissue damage results and healing is retarded.

In closing the wound, small needles which slip through with little damage to the tissues and the finest suture material compatible with the stress required should be used. Coaptation should be accurate and all of the dead spaces should be eliminated.

Interrupted sutures are to be preferred, and these should not be tied too tightly. In all clean cases silk may be safely buried and the local reaction will be much less than when catgut is used. The silk should be the finest that will accomplish the

purpose for which it is used, and the tissues included should not be strangulated by the sutures. Fine steel wire is also used frequently and gives no reaction, but on account of its strength, it is often drawn much more tightly than is necessary and strangulation of the included tissue results. The strangulation of normal tissue included in a suture or ligature may seem unimportant but where there is interference with the blood supply and necrosis occurs, there is a point for infection to begin, in the event that any pathogenic organisms are present.

C IMMUNITY FACTORS

CHAMP LIONS In considering the immunological defenses of the body against postoperative infection, it should be remembered that there are two mechanisms which are important in recovery. One of the mechanisms is the process of inflammatory fixation, whereby lymphatic and vascular capillaries are occluded around the zone of infection with a resultant exteriorization of the bacterial invaders. This isolation of the infection is important because it renders the zone of infection impermeable to circulating immune bodies of large molecular size. Hence, immune bodies cannot influence the course of an abscess, and unless the abscess is very small, surgical drainage or spontaneous evacuation is necessary for recovery (18).

The second body mechanism which deals with infections consists in the development of antibacterial and anti-toxic antibodies. These are active in the control of an infection only during the time that the inflammatory lesion can be permeated by the large size molecules possessed by such antibodies. In other words, antibodies are useful only during the invasive phase of the infection. There is a single exception to this general principle. It occasionally happens that an abscess involves the blood vessels and establishes septic intravascular thrombi from which bacteria may be distributed into the blood stream. Such a bacteremia is favorably influenced, and metastatic abscesses are frequently prevented by the presence of immune bodies in the blood.

Besredka (2) and also Gay (5) have shown that local tissues which have recovered from an infection possess for a short time a resistance to the same infection not possessed by other tissues in the body. This resistance has been called local immunity but it is not well understood. There is evidence that it is associated with and perhaps due to the presence of large mononuclear phagocytes.

3 THE TREATMENT OF AN ESTABLISHED WOUND INFECTION

A. SURGERY

JOHN S. LOCKWOOD When a wound infection develops and pus has formed, the wound should be opened to full length of the involved portion. Anaerobic as well as aerobic cultures should be taken and the causative organism determined. Then the appropriate secondary treatment may be decided upon. If the temperature is low and there do not seem to be any severe general disturbances which indicate a relatively trivial infection, the mere opening of the wound may be sufficient to cause a prompt recovery. If it is more serious the local application of specific or non-specific antiseptics may be advisable. If there is high fever, wide cellulitis, and evidence of general intoxication, internal as well as local medication is needed.

B. LOCAL SECONDARY TREATMENT

STAPHYLOCOCCUS BACTERIOPHAGE

JOHN S. LOCKWOOD This medication should be used if the organism is a staphylococcus susceptible to the available phage. The bacteriophage should be applied to the wound once or twice a day and directly contact all the infected surfaces (1).

ZINC PEROXIDE

This is to be used if the infecting organisms are anaerobes or hemolytic streptococci. With this medication the three essential requirements are (a) an effective material properly sterilized and activated (b) close contact between the creamy suspension of the powder in distilled water and (c) moist coverings over the wound with an impermeable seal to keep the dressing wet (2).

HYPOCHLORITE SOLUTION

This solution is to be prepared and used according to Carrel Dakin technique. It probably owes its beneficial effect more to its capacity to liquefy slough and necrotic tissue than to a direct lethal effect on the organisms responsible for the continuance of the infection (3). When the tissue slough is removed the bacteria are unlikely to be able to survive and elaborate their toxin. A most important factor in encouraging wound repair is the removal of necrotic tissue. Maggots (4) and their purified secretions in the form of allantoin (24) have been employed to induce similar effects, but, in our hands have not been as effective as hypochlorite solution.

Some success has been reported from the local introduction of crystalline sulfanilamide into com-

pound fracture wounds (10) but experience is as yet insufficient to warrant a blanket recommendation of this type of therapy because of the possible danger of acute toxic reactions.

X RAYS

Most radiologists are convinced of the value of small doses of x rays in the treatment of local tissue infections (11). While there is a good deal of belief among surgeons that x ray therapy is beneficial in special types of infections such as postoperative parotitis, it is as yet impossible to agree that x ray therapy is indicated in all types of postoperative wound infections.

Caution in the employment of x-ray therapy is recommended until more is known of the mechanism of the action of x rays in infections, until the possible harmful effects are understood, and until it becomes apparent that x-rays produce effects which cannot be obtained by simpler and cheaper measures such as hot wet dressings.

C. GENERAL SECONDARY TREATMENT

BACTERIOPHAGE

FRANK L. MELENEY For serious staphylococcal and bacillus-coli infections, particularly when there is a septicemia with these organisms, doubly potent bacteriophage should be employed intravenously. High potency stock phage should be started as soon as a positive culture is reported and the organism should be tested for susceptibility to the phage as soon as possible. By doubly potent phage is meant one which not only produces lysis or clearing of the culture in liquid medium but shows no growth when the cleared culture is planted on a blood agar plate. If the stock phage is not doubly potent it should, if possible, be worked up by frequent passages until it is. The initial dose of phage should be small (1 cm. or 0.25 c.cm.), but if no reactions occur it should be increased rapidly up to large doses. The amount and duration of treatment being determined by the requirement of the individual case (7).

SULFANILAMIDE COMPOUNDS

JOHN LOCKWOOD These are of value post-operatively particularly in the treatment of acute and sub-acute hemolytic streptococcal infections (12). At the present time sulfanilamide orally or parenterally can also be recommended as an adjunct to other procedures in the prophylactic management of an severe traumatic or operative injury.

when invasive infection is a likely postoperative complication

The effectiveness of the sulfanilamide will be limited unless the dosage is given at frequent intervals so as to maintain a fairly constant blood level of more than 5 mgm per cent. It will also be limited if there is extensive necrosis of tissue in the area of infection. Its effectiveness is apparently increased in infections of serous cavities in which a strong cellular defense tends to supplement the bacteriostatic effect of the drug. When sulfanilamide is used for postoperative infections the treatment can usually be stopped within from five to seven days, so that the serious toxic reactions encountered with prolonged therapy are not likely to occur. Daily blood counts must be made in order to guard against hemolytic anuria and granulocytosis.

Sulfapyridine is of great value in postoperative pulmonary infections, particularly those in which the pneumococcus is responsible. In the past few months sulfathiazole has been found to be quite as effective against the pneumococcus as sulfapyridine and is preferable because it is less nauseating and less toxic.

While sulfanilamide, sulfapyridine, and sulfathiazole all seem to possess some degree of effectiveness against the staphylococcus in the test tube and in animals, their relative effectiveness in human infections has not yet been determined. None has an effect against this organism comparable to that enjoyed by all against the hemolytic streptococcus. For general staphylococcal infections, however, sulfathiazole may be employed in conjunction with doubly potent bacteriophage. None of the sulfonamide group of drugs interferes with phage action (33). The severe toxic effects which are reported for sulfamethylthiazol make that drug too dangerous to employ.

SERUM TREATMENT

CHAMP LYONS It seems pertinent to briefly review the nature and properties of the immune bodies as they exist for the microorganisms of surgical importance.

Staphylococci Numerous antibodies are described for staphylococci and their toxic products. The commercially available antitoxin neutralizes the staphylococcal hemolysin. Rabbits are susceptible to this toxin, and the antitoxin favorably influences the course of staphylococcal infection in rabbits. This is the basis for the use of such an antitoxin in human beings, but all available evidence indicates that the human being is not very susceptible to the action of this hemolysin. Hu-

man leucocytes are susceptible to a staphylococcal leucocidin, but no effective antileucocidin sera are commercially available. Anti-bacterial antibodies have been recognized for the staphylococcus, and it is possible to divide the staphylococci into several types with such sera, but if one attempts to find some correlation between the presence or absence of these anti-bacterial antibodies and the eventual outcome of infected patients, it cannot always be demonstrated that survival from a staphylococcus bacteremia is associated with the presence of antibodies of this type. Furthermore, it has been shown that inflammatory fixation occurs so rapidly with staphylococcus infection, that it is unlikely that circulating immune bodies could effectively influence the course of such infections.

Hemolytic streptococci The important antibody in streptococcal infections is the anti-bacterial antibody, and it is effective in influencing the course of the infection favorably. For several years infected patients have been passively immunized by the method of immunotransfusion (19). The introduction of sulfanilamide has not made this procedure unnecessary. The combination of immune serum and sulfanilamide is so much more effective than either one alone that their use should be combined. A partial explanation of this lies in the fact that sera of low potency are now useful when given with sulfanilamide, and that sulfanilamide alone has sometimes failed to completely control streptococcal infection in a satisfactory manner.

Colon bacilli Increasing experimental evidence demonstrates that the colon bacillus contains a toxic substance which can be neutralized by an appropriate immune serum (8). The toxic component of colon bacillus is an endotoxin, and, hence, the immune serum is limited by the fact that it can neutralize at most only a few minimal lethal doses of the substance. Various strains of colon bacillus contain various types of endotoxins, so that an effective antitoxin must be specific for the particular infecting strain. Specific and potent sera are not yet generally available for use with bacillus-coli infections.

THE IMPORTANCE OF RECORDS

FRANK L. MELENEY The necessity for accurate and complete records in every hospital where any attempt is made to study and solve this problem must be fully appreciated. General impressions are of no value whatsoever. This was amply proved at the Presbyterian Hospital in New York City when a careful study of wound infection was initiated in 1925. The occurrence of several hemo-

WOUND INFECTION OVER A PERIOD OF FIFTEEN
YEARS PRESBYTERIAN HOSPITAL, NEW YORK
NEW YORK

Year	Total Cases	Clean Cases		Infected Cases					
		Number	Per cent	Serious	Free	Total	Per cent	Total	Per cent
1907	58	44	86	14		14		14	
1908	53	40.4	8	13		13		13	8
1909	613	51	8.3	14		14		14	
1910	640	17	2.6	10		10		10	
1911	77	70.3	9.1	7		7		7	6.6
1912	747	67	9.0			9.0			9.0
1913	30	22	73.3	8		8		8	26.7
1914	106	99.7	94.1			4.3		4.3	4.1
1915	17	16.76	98.6			0.24		0.24	1.4
1916	179	123	68.7			56		56	31.3
1917	1,577	373	23.6			1,204		1,204	76.4
1918	53	30.8	58.1	22		22		22	41.9
1919	554	517	93.3			37		37	6.7
1920	1,648	1,413	85.7			235		235	14.3
1921	2,725	1,841	67.4	19		19		19	0.7

lytic streptococcus wound infections in clean cases led one of the authors to ask the head of one of the surgical services what he thought the incidence of wound infections would be on his wards.

He replied that he thought if every trivial and serious infection were counted that it would amount to 3 per cent. A careful survey revealed that in the year 1925 it was 14 per cent. Ever since then there has been a continuous study of postoperative infections. They are reported each week at the Staff Conferences and once a year a detailed summary is presented with an analysis of individual cases. This has kept every member of the staff alive to his own responsibility in maintaining his sterile technique at the highest possible level. Each year modifications in the sterile technique have been instituted where weaknesses were shown to exist and this has resulted in a gratifying lowering of the incidence both of the trivial and the serious infections, as the accompanying table shows (22).

It has been found advisable to have some member of the staff who is made responsible for a review of every case record. Notes are kept on individual cards of all important details of the operation and of the postoperative course in relation to the wound healing. A copy of such a record card is given below. If such records could be kept by a number of clinics with a periodical comparison of results and methods, there would be a steady improvement of sterile technique which might then serve as an example to smaller hospitals unable to carry on such studies.

WOUND HEALING	REMARKS
OPERATIONS	ant se pt
Clean	
Hematomas	
Stitch Abscess	
Necrosis	
Debridement	
Drain	
Self	
Cutout	
TRIVIAL INFECTION	
SERIOUS INFECTION	
ANALYSIS	Operation— ant Aust— ant Aust— at Sterile Nurse— and Sterile Nurse— Anesthetist—

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STERILIZATION AND ASEPTIC OPERATING ROOM TECHNIQUE

ELLIOT C. CUTLER, M.D. F.A.C.S., Boston, Massachusetts—Presiding

Collaborators: CARL W. WALTER, M.D. Boston, Massachusetts; DERTL HART, M.D., F.A.C.S., Durham, North Carolina; FRANK L. MELENEY, M.D., F.A.C.S., New York, New York; E. E. ECKER, Ph.D., Cleveland, Ohio; EARLE H. SPAULDING, Ph.D. Philadelphia, Pennsylvania

INTRODUCTION

THIS Panel Discussion will attempt to cover the more important phases of sterilization and aseptic operating-room technique. Obviously we cannot go into great detail, but we have experts here who are prepared to do their utmost to answer questions put to us in this field. We shall attempt to cover first the least controversial subject in this field, The Sterilization of Dressings and Dry-Goods. Presumably every doctor has seen an autoclave in action and understands that sterilization by steam under pressure is the most desirable method. However I fear few doctors have ever run an autoclave, and almost no doctors appreciate the practical phys-

ical difficulties which are inherent in the autoclave. It appeared simpler and more rapid to demonstrate this topic by a moving picture reel. When this is over I hope the dangers of autoclave sterilization will be clear.

The movie portrays the customary hospital practice in sterilizing dressings, indicates the errors in the traditional technique illustrates the physical and bacteriological principles involved, and builds up a safe technique by applying these principles. The extraordinary responsibility assumed by personnel and the need for constant, intelligent supervision is emphasized. Standardization of packaging and loading is recommended and the acceptance of a uniform minimum for sterilization is advocated.

Immediately following this presentation we shall expect questions from the floor to elaborate further upon our general topic, Sterilization and Aseptic Operating Room Technique.

Presiding Chief, Peter Bent Brigham Hospital, Member Professor of Surgery Harvard Medical School, Boston, Massachusetts

Panel Discussion, Chas. C. Conner of the American College of Surgeons, Philadelphia, Penna. Press, October 7, 1930

THE STERILIZATION OF DRESSINGS AND DRY GOODS

CARL W. WALTER, M.D. Boston, Massachusetts

THE sterilization (7-10) of surgical supplies requires a reliable, readily available, inexpensive agent which destroys all microbial life but which does not deteriorate such supplies. Saturated steam has been adapted for this purpose because of its rapid action and its general applicability. Steam is a reliable microbicide with definite limitations which are well known because its lethal action depends upon physical properties which are measurable. In the range of temperature and pressure ordinarily used for sterilization, the abstraction of heat from steam, as by contact with a cold ob-

ject causes a change in its state of aggregation. Dissipation of its heat of vaporization is attended with a marked decrease in volume because of the condensation from vapor to water. Thus, steam simultaneously provides the two essentials for the destruction of bacterial life—heat, in the form of latent energy and moisture in the form of a condensate. Factors which decrease or nullify the lethal effect of saturated steam have been described, but their importance has been appreciated by few surgeons.

The use of steam as a sterilizing agent has become a mysterious process to most surgeons because the responsibility for the maintenance of a stock of sterile surgical supplies has been delegated to subordinates. Too often convenience and expediency have prompted the improvisation of

From the Laboratory for Surgical Research, Harvard Medical School, and the Surgical Clinic, Peter Bent Brigham Hospital. My statement is based on the pressure of the steam, the greatest possible for water vapor at the given temperature. The water therefore, is in a state lying on the boundary between two phases of aggregation, as between liquid water and vapor (steam).

"sterilizing" techniques (4, 5, 8, 13, 21) by those ignorant of the basic biological and physical facts which determine the efficacy of steam as a bactericide. Local tradition and custom thus define sterilization with dictatorial finesse.

Most hospitals are equipped with sterilizers which are capable of destroying all bacterial life if they are properly loaded with carefully packaged supplies and are operated intelligently. The surgeon's chief concern in sterilization, safety for his patient, can be assured most readily by the standardization of technique for steam sterilization. The basic principles upon which a reliable technique must rest are demonstrated in the accompanying graphs which were selected from the diagrams shown during the Midday Panel Discussion (6) in the motion picture "Aseptic Technic."

The application of well substantiated physical and bacteriological observations to the development of a correct technique for the sterilization of surgical supplies in the steam sterilizer requires consideration of the following recommendations:

- 1 Adoption of bacteriological standards known to assure absolute sterility
- 2 Intelligent modernization of sterilizers to provide
 - a An adequate quantity of steam (pounds of steam per hour rather than pressure head) to permit prompt heating of the load
 - b A means of measuring (by thermometer or otherwise) the temperature of the fluid in the exhaust line of the sterilizer
 - c A timer which automatically indicates the maintenance of a temperature of 250° F in the exhaust line for a continuous period
- 3 Elimination of the necessity to overload sterilizers by the provision of adequate sterilizer capacity (cubic feet of usable space, not number of sterilizers) to permit operation at no more than 85 per cent capacity during the normal working hours of the sterilizer attendants
- 4 Periodic inspection of the sterilizers by a trained mechanic who understands the design and use of sterilizers, and who appreciates the importance of their proper maintenance. Many intelligent sterilizer attendants are forced to use defective equipment because of the opinionated ignorance of those charged with the maintenance of sterilizers and their source of steam
- 5 Acceptance of the principle of gravity air clearance to assure complete penetration of the load by saturated steam
- 6 Standardization of packaging in porous cloth wrappers (abandonment of metal containers)

7 Folding and arranging of supplies to facilitate the interchange of air and steam

8 Packaging to insure complete penetration in a period permitting sterilization when exposed to saturated steam at 250° F for thirty minutes

9 Loading sterilizers so as to provide a horizontal path for the escape of air from all portions of the load

10 Employment of permanent personnel, trained in proper packaging and loading, who realize their responsibility and perform their duties wholeheartedly

11 Enforcement of a standard technique requiring a continuous exposure to saturated steam at 250° F for thirty minutes as indicated by the temperature in the exhaust line

DISCUSSION OF DATA

Fig 1 The exposure necessary to destroy resistant spores in saturated steam depends upon the temperature of the steam. Raising the temperature markedly decreases the exposure required (2, 3)

Fig 2 The destruction of bacterial life by heat is probably caused by the heat-denaturation of protein. Because proteins coagulate much more readily and at lower temperatures in the presence of moisture, sterilization is more easily accomplished by moist than by dry heat (15)

Fig 3 Saturated steam is an ideal sterilizing agent for surgical dressings because it furnishes simultaneously the heat (latent energy of vaporization) and the moisture (water of condensation) essential for the destruction of bacterial life (11). The latent energy of 94 cubic feet of steam is required to heat 3 laparotomy kits (55 lb) to sterilizing temperature. As this energy exchange occurs, 66 lb of water are deposited throughout the fabric by condensation of the steam which has flowed into the kits.

Fig 4 The bactericidal action of steam cannot be utilized until all the air is removed from the sterilizing chamber (9, 12, 22). Steam does not mix readily with air which protects unsterile material against contact with the steam. Because steam is lighter than air (Fig 5), it stratifies over the heavier air as it is forced into the sterilizer and drives the air downward as effectively as if it were a piston. Thermocouples, located as indicated at 1, 2, and 3, record this action.

Fig 5 As steam is forced into a closed chamber full of air, both steam and air are compressed as the pressure rises and become more dense. Throughout the compression the air (10) is approximately twice as heavy as the steam (18), does not mix readily with it, and stratifies at the bottom of the chamber (Figs 4 and 10).

Fig 6 The quantitative aspects of steam sterilization are illustrated by the fact that almost a liter of steam is required to heat a surgeon's glove to sterilizing temperature (865 c.cm. of steam for a size 7 glove weighing 13.6 gm.)

The collapse in volume (99 per cent shrinkage) which occurs during condensation results in the instantaneous development of local areas of negative pressure in the region where cold fabric is encountered. More steam, bearing its load of latent heat, rushes in to overcome the low pressure, contacts cold fabric, and in turn condenses. Thus, penetration by steam is a self-perpetuating process which continues as long as steam comes in contact with colder objects.

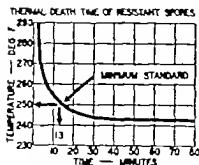


Fig. 7

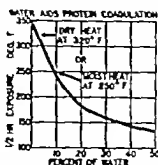


Fig. 8

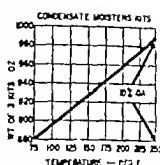


Fig. 9

Fig. 7 Saturated steam has characteristic temperature at any given pressure. When air is mixed with the steam, the temperature of the mixture is depressed markedly as indicated. If one-third of the air is removed from an autoclave, as by drawing 6-in. vacuum prior to introducing steam under pressure of 3 psi, the temperature of the mixture of residual air and steam is 225°F () instead of 30°F that characteristic of saturated steam under pressure of 3 psi.

Fig. 8 Steam is an efficient heating agent because most of its energy (8 per cent at 30°F) is in the form of latent heat. If air is introduced into the steam, this efficiency is markedly decreased (7) since the thermal capacity of air is low.

Fig. 9 Steam heats porous materials by actually flowing into them and liberating its latent energy.

The convection currents by which steam penetrates are created because of the difference in density (Fig. 5) between the steam and the air which it displaces from the junctions of the fabric. Once begun, convection is maintained by the collapse in volume which occurs when steam condenses (Fig. 6).

The power of steam penetration as compared with air and steam mixtures or hot air alone, as determined by recording the time and temperature relationships in the center of identical 6 in. cubes of folded muslin. It took mixture of air and steam nine hours to reach maximum of 3°F hot air; 5 degrees heated the test bundle in twenty-four hours, while steam penetrated the cube in only four hours.

Fig. The detrimental effect of air on steam sterilization is illustrated in terms of actual temperatures attained in an autoclave (unpacked type containing 30 cu ft) not which saturated steam was admitted under pressure of 3 psi. The air which initially filled the chamber was re-

tained by closing the air exhaust line. Thermocouples (2, 3), located as shown in Fig. 4, measured the temperature of the air and steam system at the respective levels indicated. The lighter hotter steam (6.5 cu. ft., density .075 lb./cu. ft. temperature 340°F) layered over the heavier colder air (9.8 cu. ft.; density .36 lb./cu. ft. temperature 30°F) which was compressed into the lower half of the chamber.

Such stratified system maintains itself indefinitely unless convection currents are established. In this experiment an electric fan was used to create homogeneous mixture at 3 degrees. The fact that stratification occurred as soon as the fan was stopped is of great importance for sterilization because it illustrates that air and steam do not form stable mixtures. This explains why air can be removed from sterilizer yet, paradoxically, it remains trapped in so uncovered, upright containers in the otherwise air-free chamber.

When the exhaust line was opened, the air was displaced by forcing steam into the sterilizer under pressure. The completeness of the air ejection is shown by the temperature at the bottom of the chamber which rose to 30 degrees and indicated that saturated steam under pressure of 3 psi filled the entire chamber. The importance of providing horizontal path for the downward escape of the air displaced by the leaping steam and the reliability and effectiveness of gravity air clearance are illustrated by this graph.

Surgical supplies are usually sterilized in steam-jacketed autoclaves, known as dressing sterilizers, which differ from the simple, single-chamber autoclave used here. Dressing sterilizers are designed so that steam under pressure can be admitted to the space between the jacket and the chamber wall to heat the latter to the temperature characteristic of the steam and thus to prevent condensation on the lower

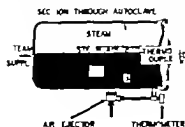


Fig. 4

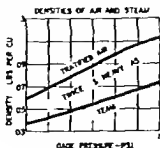


Fig. 5

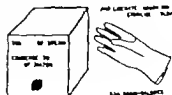


Fig. 6

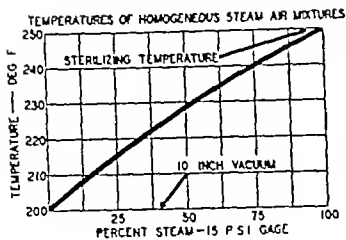


Fig 7

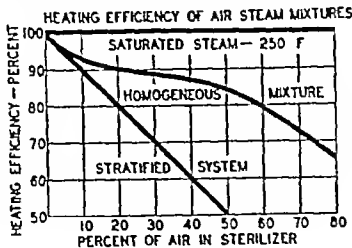


Fig 8

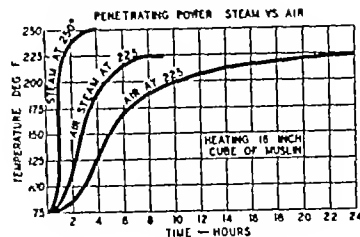


Fig 9

surface of the chamber. The hot jacket also aids in drying the load after sterilization has been completed. Temperature studies made in such a sterilizer are misleading because they may reflect the heating effect of the steam confined in the jacket rather than the heating efficiency of the steam within the chamber. Similarly, the fact that dressings are hot when they are removed from a dressing sterilizer does not mean that they are sterile. For example, a dressing sterilizer can be closed and steam turned into the jacket, but not into the chamber, which converts the sterilizer into a hot air oven. The contents of the chamber eventually are heated to the temperature of the steam in the jacket, but that temperature is not lethal when hot air is used as the heat transfer agent. A comparable situation exists when steam is admitted into both jacket and chamber at a pressure of 15 psi, and the air is not permitted to escape. The air and steam mixture stratifies initially but soon becomes homogeneous as it is heated by the jacket. Ultimately it is superheated (56 degrees superheat, relative humidity 33 per cent) and becomes a slow acting, unreliable bactericide.

Regardless of the type of steam sterilizer used, gravity air clearance is dependable because both the air and the air and steam mixtures discussed are heavier than saturated steam under similar pressure. (Densities: air at 250° F and atmospheric pressure 0.057 lb per cu ft, air and steam at 250° F and 15 psi—0.1 lb per cu ft., steam at atmospheric pressure—0.033, at 15 psi 0.072, respectively.)

Fig 11. Steam displaces air from packages of dressings by a process similar to that illustrated in Figures 4 and 10. Thermocouples located at 1, 2, 3, 4 indicate in terms of temperature the composition of the air and steam mixtures at various levels inside of the chamber and within the bundle of dressings.

Fig 12. The efficacy of gravity air clearance in removing the air, not only from the chamber but also from the load, is illustrated in this chart. One third of the air was removed from the chamber by a 10-in initial vacuum. Steam was then admitted under a pressure of 15 psi. The residual two-

thirds of air was retained by closing the air exhaust line. The temperatures at the top of the chamber (1) (Fig 11) and top of the bundle (2) rose as the light hot steam stratified at the top of the chamber and compressed the residual air downward. The temperatures of the bottom of the chamber (3) and bottom of the bundle (4) remained low because the cold air that was present prevented contact with the steam.

In this experiment spores in the top of the bundle would have been sterilized while those in the bottom would have escaped destruction because the air protected them from the steam. When the air was permitted to escape by opening the air ejector slightly, steam soon displaced the air, establishing sterilizing conditions throughout.

Despite the fact that one third of the air was removed by drawing an initial vacuum of 10 in—a widespread custom—the remaining two thirds of the air prevented sterilization until it was permitted to escape by gravity. The fallacy of the custom is obvious as is the needless expense of creating the vacuum.

Fig 13. Steam must have free access to packages to insure rapid, dependable sterilization. Metal containers limit the surface of the package exposed for the interchange of air and steam and may retard sterilization (14, 16, 20). This is illustrated by the heating curves of identical rolls of sheeting 6 by 17½ in in diameter. One was wrapped in four thicknesses of muslin, the other was enclosed in the conventional dressing drum. Both were placed in the sterilizer on edge. The perforations about the periphery of the drum were open. The chamber temperature rose to sterilizing level in twenty minutes. The muslin wrapped roll was penetrated in sixty five minutes, while the roll in the dressing drum was not heated throughout for 175 minutes. The limitation of area available for the interchange of air and steam to the perforations about the periphery of the drum was responsible for the delayed penetration. Metal dressing drums are expensive, noisy, and cumbersome. They contribute little to aseptic technique and should be abandoned.

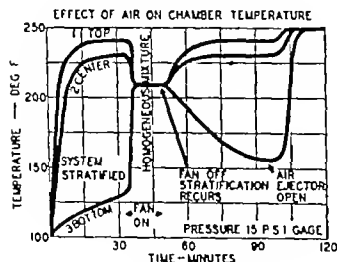


Fig 10

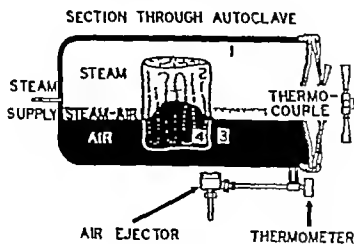


Fig 11

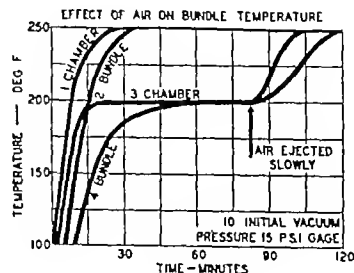


Fig 12

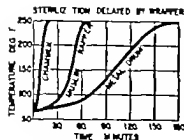


Fig. 3.

Fig. 3. The routine control of the process of steam sterilization of surgical dressings requires knowledge of four factors which influence the efficacy of the process.

The quality of the steam being used in the sterilizer must be determined. The temperature of the fluid in the exhaust line indicates whether air, steam, or a mixture of the two occupy the lower portion of the sterilizer. If the chamber pressure is 5 psi, the temperature in the exhaust line will rise to 50° F when saturated steam has displaced the air and fills the chamber.

The period necessary for complete penetration of the largest bundle must be known. This can be controlled by establishing standard size, shape, and internal arrangement for the largest bundle. A laparotomy kit weighing 8 lb can be packed in a package by 3 by 8½ in. in such fashion that it will be heated throughout consistently fourteen minutes after the temperature in the exhaust line rises to 50° F (Fig. 3).



Fig. 5 (top) b (bottom)

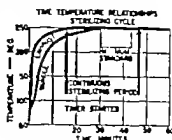


Fig. 4.

3. The sterilizer must be loaded to provide a horizontal path for the escape of air. The internal arrangement of the laparotomy bundle is such that air is displaced most readily when the package is placed in the sterilizer on its side by 8 in. side. Care must be taken to leave free space for the circulation of steam above and below each package.

4. The period of continuous exposure to saturated steam must be ascertained. Such exposure is essential because, as steam penetrates a package, it condenses on the thread of the fabric in quantities proportional to the heat required to raise such material to the temperature of the steam. The heating spreads centrifugally in distinct zones of demarcation; the temperature necessary for sterilization covers only

here the goods are moist, few centimeters in advance of the zone the fabric is dry and relatively cool. If this wet-dry heating is checked, the outer third of moist fabric cools and must be reheated. If the outer one-third of the package cools to 25 degrees, 30 per cent more steam is required to reheat the outer third (two-thirds of the package by weight) because the moisture left in the fabric by the initial heating (Fig. 4) requires additional heat.

The temperature of the fluid in the exhaust line indicates the quality of the steam being used in the chamber (Fig. 3).

When it comes to the characteristics of saturated steam under the pressure being used, all the air has been displaced from the chamber. In the large sterilizer used in this experiment the thermometer located in the exhaust line indicated the presence of saturated steam (50° F) in seventeen minutes. The thermometer in the center of the bundle did not indicate complete penetration by steam until thirteen minutes later. As the size, shape and internal arrangement of the laparotomy kit (Fig. 3) has been standardized, the period necessary for penetration is uniform.

The sterilizing period can be measured, therefore, from the moment the pure steam fills the chamber. A period of thirty consecutive minutes provides for complete penetration of the load plus thirteen minutes for exposure of the least accessible area of the bundle to saturated steam at 150 degrees (AIAA standard Fig. 5).

Fig. 5. Sterilization can be facilitated by packaging to insure penetration by steam in uniform period. The general principles of packaging the supplies for laparotomy are illustrated. The wooden trough (a) serves to hold the size and shape of the package. The wrapper consists of 1 sheet (6½ by 90 in.) folded crosswise which are draped to line the trough (b) as the first step in making the package. Supplies needed during the operation (specimens, abdominal packs, additional towels, anal dressing) are placed in the bottom layer. The laparotomy sheet, suitably folded and rolled to afford easy draping so it is ready for penetration of the center of the bundle occupies the center of the second layer. This sheet, designed to cover the hole field from anestheticist's screen to patient's feet, is secured

pleated from top and bottom toward the opening for the operative field. The pleated sheet is then rolled from either side toward the center to form relatively open parallel rolls. When properly located in the package, the sheet effectively divides the contents into four small sections which are easily sterilized. Towels for draping the skin are piled on top of the rolls, gowns for the team are arranged about this central pile to fill the space in the wooden trough.

Two ends of the folded sheets are brought across the top of the hundle and tucked into the crevice between the pile of supplies and the sheet lining the trough. The folded edge of the sheets is lapped over these thicknesses of sheeting. The other two ends are then overlapped to close the package against accidental contamination. The bundle is completed just as any paper wrapped package and secured by a library tie of Venetian blind cord.

This package can be opened for operation by an unsterile nurse. Its contents are instantaneously accessible in the order in which they are required.

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IS STERILIZATION OF THE AIR BY THE USE OF ULTRAVIOLET RADIATION OF BENEFIT?

DERYL HART M.D. F.A.C.S., Durham, North Carolina

IN attempting to answer the question as to whether or not sterilization of the air by the use of ultraviolet radiation is or is not of benefit, there are a number of questions to be considered.

1. What is the condition of the air and if it is contaminated is it a universal or local condition?

2. What is the source of this contamination if present?

3. What can be done to reduce or eliminate this contamination?

4. Can the wound become infected from the bacteria floating in the air and falling into the wound?

5. What will ultraviolet radiation accomplish as regards bacteria on plates of culture media, and as regards bacteria floating in the air and dropping on plates of culture media and what are the results obtained on patients insofar as postoperative wound infection is concerned and insofar as the postoperative elevation and duration of temperature elevation is concerned?

In regard to the degree of air contamination, this varies with the time of year and is further dependent on the number of occupants in the room and on the flora in the noses and throats of the occupants. It is higher during those parts of the year when the respiratory infections are pre-dominant and diminishes during the times of year when the people are relatively free of such infections. Cultures in approximately 40 hospitals located over a wide area of the United States showed that pathogenic bacteria were present in the air in all operating rooms, and that the most common organism was the staphylococcus, the albus type being found most often, while the aureus, hemolytic and non-hemolytic were not at all unusual, and at times there were as many as 50 colonies of the staphylococcus aureus sedimenting on a Petri dish within one hour's exposure.

It was found that the air-conditioned operating rooms had a much lower air contamination than those of the non-air-conditioned hospitals. This was caused, first, by an elimination of many or most of the non-pathogenic bacteria in the outside air and, second, by the washing out or reduc-

tion in the number of pathogenic organisms given off by the occupants of the room as a result of the more efficient ventilation. In our hospital we have found that the incoming air was practically sterile whereas cultures made above the roof of the hospital at the air intake and cultures made in the washing chamber before this air was washed and filtered showed many bacteria. Air in the ducts after it had been washed and filtered was practically free of organisms. Utilizing this clean air in large quantities for ventilation, we attempted to reduce the bacterial contamination in the operating rooms to a level where it would not be of danger to the patient. The reduction could be brought about quite rapidly as long as there were no occupants of the room, but as soon as it was occupied by an operating team the contamination could not be brought down to a level which we believed would be safe for an open wound. The air was cultured as it came into the operating room and was found to be practically sterile. The air above the hospital roof had gram-negative bacilli and fungi whereas the air leaving the operating room contained staphylococci predominantly.

Many other measures were taken to try to reduce the air contamination. The number of visitors was reduced to the minimum; the walls were washed daily and painted frequently; the floor was mopped with an antiseptic between operations; masks were worn at all times whether or not operations were in progress; for large operative procedures double masks of 8 thicknesses of butter gauze were worn; and large operative procedures were postponed only as the first case in the morning after the room had been closed over night. It had been determined by sedimentation methods that the air which was contaminated to the extent of from 50 to 100 colonies sedimenting on a Petri dish per hour of exposure showed only

to 3 colonies per Petri dish per hour of exposure after the room had been closed for a period from twelve to twenty-four hours. Thus, in the early morning hours the air was practically free of sedimenting bacteria; however as soon as the nurses entered the room the air contamination rose quite rapidly. This same rise, however, could not be obtained by the use of electric fans to stir up the

dust on the floor. It was thought that this rise was due to a recontamination rather than a stirring-up of organisms which had settled to the floor. As noted above, the floor was washed frequently with antiseptic solutions to take care of any settling of dust. There was an average of 1 to 3 colonies sedimenting on a Petri dish when the room was quiet from 4 to 5 o'clock in the morning after the room had been closed overnight. The number of sedimenting colonies could not be raised above an average of 2 to 4 or 5 colonies with an electric fan blowing on the floor to stir up any bacteria which may have settled there.

By these various measures the air contamination was appreciably reduced but not to the level to give a satisfactory reduction in the number of postoperative wound infections. An attempt was made to eliminate carriers, both in the personnel and among the patients. Over a period of time the nose and throat of every patient was cultured before operation and every member of the operating-room personnel had his nose and throat cultured frequently. At one time we found that as many as 80 per cent of the personnel and 80 per cent of the general population had the staphylococcus aureus in their nose and/or throat so that it seemed impractical to eliminate every possible carrier. However, those who were known to be persistent carriers with a heavy contamination of their throats were not allowed to work in the operating room where large clean operations were performed.

The average mask is not satisfactory for eliminating the contamination of the air from the nose and throat. The criterion for a good mask should be that it could be used on as many people as ordinarily work in an operating room over several hours without an appreciable rise in the bacteria from this source.

We would answer the fourth question, "Do wounds become infected from these organisms floating in the air?" in the affirmative. Over several years' time we tested the air at frequent intervals, daily, for many months at a time. At times the organisms were cultured from the air before the wound showed evidence of infection and when this infection showed up the same organism was present. Our severe infections were caused almost exclusively by the hemolytic staphylococcus aureus. Furthermore, we found that when the air contamination with this organism was low we did not get wound infections, and when it became high, we had an appreciable number of infections with this organism. Our infection rate was approximately 4 per cent in

clean primary incisions after we had taken all possible measures to reduce it. It is our opinion that during an epidemic of streptococcal sore throats the streptococcal wound infections would rise. This is well exemplified by conditions during the influenza epidemic during the World War when many operating rooms were closed except for emergency operations. Streptococcal sore throats were widespread and there were many streptococcal wound infections at that time.

Since all other measures for controlling the contamination failed or were only partially satisfactory, we turned to ultraviolet radiation as a method of destroying the bacteria after the air had become contaminated. This proved to be highly satisfactory by every test which we made. Using an intensity of radiation which with different installations varied from around 24 to 32 microwatts per sq. cm. at the operative site, and varying intensities throughout the other parts of the room, depending on the type of installation, we obtained uniformly satisfactory results. Bacteria, hemolytic staphylococcus aureus, on plates of blood agar, could be killed within one to two minutes' exposure at the operative site, and when Petri dishes were exposed at distances as far as 10 ft. from the source of radiation they could be practically sterilized within thirty minutes or less. Cultures made during operations of sedimentation of bacteria from the air on plates of blood agar showed that the number of colonies falling on a Petri dish at the operative site could be reduced from levels as high as from 100 to 1000 to 1 to 3 colonies per Petri dish per hour of exposure. The Petri dish, of course, was exposed to continuous irradiation just as the sterile supplies are left exposed to continuous radiation. The two are comparable. More viable bacteria have dropped on the Petri dish and have been killed after falling on it but similar results of organisms falling on the sterile supplies could also be killed. In other parts of the room the intensity of radiation was not so great and the reduction in the number of bacteria was correspondingly not so great. However, with the type of installation used most commonly the number of viable bacteria per Petri dish at the periphery of the room seldom exceeded 4 or 5 colonies per Petri dish per hour of exposure.

In regard to the results obtained previously there was an immediate reduction in wound infections. Before beginning the use of ultraviolet radiation there had been a number of wound infections in such cases as amputations, craniotomies, arthroplasties, and other operations. Since beginning the use of ultraviolet radiation, in a large

series of operations, no patient operated on under the ultraviolet radiation has died of a wound infection. The infection rate has been reduced from an average of 4 per cent in clean primary incisions of small magnitude to considerably less than 1 per cent in the extensive operations when the radiation was used. In the latter group were all thoracoplasties, radical mastectomies, craniotomies, laminectomies, and arthroplasties. Some of these more extensive operations in the series without radiation had had an infection rate considerably higher than the 4 per cent general average. The postoperative temperature reactions of the patients operated on with radiation have also shown a marked improvement. The average duration of temperature elevation following operation for thoracoplasties, radical mastectomies, and inguinal herniorrhaphies showed an appreciable reduction throughout the entire year but the reduction was directly proportional to the amount of air contamination, and at times was as great as 50 per cent when the air contamination was high in the winter and spring months the greatest improvement was noted in the shortening of the postoperative temperature elevation.

Likewise, the height to which the temperature went following operation was also reduced in direct proportion to the degree of contamination of the air. It is our impression that the improvement in this postoperative temperature reaction, with less soreness in the wound and improved healing, is probably of equal if not of more importance than the occasional elimination of infection.

We believe that ultraviolet radiation is the only satisfactory method of sterilizing the air that is available at the present time and that by this method the air contamination can be reduced to a level where there is little risk of infection of the wound by the organisms present. There is some evidence that the organisms which are not killed may be attenuated by their exposure. In regard to the occasional infection in the wounds when radiation has been used, there has been an adequate explanation as to its source in almost every case. Most common of these infections has been a stitch abscess. This, of course, has most likely resulted from the fact that a stitch was left in for a sufficient period of time to permit the growth of skin organisms and to allow the reaction to take place.

THE PROBLEM OF CATGUT STERILITY

FRANK L. MELENEY M.D. F.A.C.S., New York, New York

CATGUT is prepared from the intestines of sheep and is therefore grossly contaminated with intestinal bacteria. The most important of these are the spore-forming anaerobes, including the tetanus bacillus and the various species producing gas gangrene.

Spore-forming organisms are resistant both to heat and to chemical antiseptics. It is generally agreed that it is virtually impossible to destroy these organisms by any chemical substances without destroying at the same time some of the desirable physical properties of catgut. The only way to sterilize catgut safely is by some heating process, and if the heat is excessive or prolonged the desirable physical properties may likewise be destroyed. There is, however, a margin of safety in which heat sterilization of catgut may be accomplished and the catgut still retain its tensile strength, its pliability, and its absorbability.

In the past, certain firms manufacturing catgut sutures have tried to compromise on sterility in

order to have their product stronger and more pliable. They have not subjected their product to adequate bacteriological tests in order to be sure of its sterility before putting it on the market.

In 1925 I had the opportunity of studying a case of fatal postoperative gas gangrene which was 1 of 5 cases operated upon during a single week in one of the New York hospitals. All of the patients died of postoperative wound infection with gas-gangrene organisms. Specimens of catgut from the same lot which was used in these cases revealed the same organism which was recovered from the wound of the patient whom I studied, as well as several other pathogenic and non-pathogenic spore-forming anaerobic bacteria. This seemed to prove conclusively that the infection came from the catgut and that the catgut was not properly sterilized. Such demonstration has been made on a number of other occasions.

Dr. Welch told me at the time that one of the reasons that Halsted turned to silk as a suture material was his belief that catgut sterility could not be depended upon.

From the Bacteriological Research Laboratory of the Department of Surgery of Columbia University and the Surgical Service of the Presbyterian Hospital.

This demonstration led me to undertake a study of the problem of catgut sterility and, with the aid of funds supplied by four of the principal firms manufacturing catgut sutures, a two-year study was made.

First we examined a large number of specimens of catgut purchased on the open market and found that 22 of 174 were contaminated. The products of 18 different firms were represented, 8 of which had put out unsterile catgut. These specimens came from 12 different surgical clinics in 11 different states of the Union. This indicated a fairly wide distribution of unsterile catgut, and the seriousness of the problem was obvious.

We also found that some firms were making no attempt to check the sterility of their product by an aerobic-culture technique. We, thereupon, worked out a test for sterility which would be adequate and could be readily applied not only by the manufacturers but by hospital laboratories. These studies were reported in 1931, and there immediately followed a renewal of interest and a greater effort on the part of the firms to put out a sterile product.

However, later studies by Clock and by Brewer and Brown, as well as tests performed by the Food and Drugs Administration, clearly showed that it was still possible to purchase unsterile catgut on the open market.

The American College of Surgeons and, later, the American Medical Association were asked to set up a control, but neither of these organizations was financially able to undertake such a control nor did they have the laboratory facilities to set up an adequate control.

An effort was then made to have some governmental agency, such as the Bureau of Standards or the National Institute of Health, undertake this control, but they likewise were not in a position to undertake it.

Finally, the whole subject of sterile surgical goods was considered by Congress and incorporated into the new Food and Drugs Act, which went into operation a year ago. Catgut is now legally recognized as a drug used for the treatment of disease and it must conform to the United States Pharmacopeia. During the past year an advisory committee on sterile surgical products has been working on the standards for these materials which have been incorporated in a supplement to the eleventh decennial revision of the U. S. Pharmacopeia.

These standards include passing the test for the sterility of catgut which we originally worked out with the addition of a few minor changes suggested by Clock to include more adequate controls. This Supplement was published on January 1st and will become effective on July 1st, as an official standard.

The Food and Drugs Administration is equipped with funds and with personnel to collect specimens from the open market all over the country and with a laboratory adequately equipped to test these products. Under the law it will then have the power to stop the further distribution of any unsterile catgut. We believe that this will result in the eventual elimination of unsterile catgut and the disappearance of those firms which are unwilling or not able to take the trouble to produce a dependable product.

ARE THERE SATISFACTORY CHEMICAL METHODS FOR THE STERILIZATION OF INSTRUMENTS?

L. L. CUTLER, Ph.D., Cleveland, Ohio

IN the short time allotted to me for the discussion of chemical sterilization of instruments I beg to call your attention to the great need for more consistent and reliable methods for securing sterility in preoperative routine. I do not believe that I stand far ahead when I suggest to you that the standardization of all procedures should be the aim of the College.

We sent 27 letters to leading hospitals in all sections of the country and received 106 replies.

From the results of this survey the following table was compiled:

Of these, 75 place their dull instruments in boiling water for periods ranging from ten to thirty minutes. Twenty-four hospitals autoclave their instruments at from 10 to 30 lb. with no mention of the temperature attained during sterilization, and 11 combine boiling and autoclaving. Three institutions boil their instruments in 1 to 2 per cent soda water. It was found that 40 hospitals boil their sharp instruments from five to thirty minutes. Ten heat their sharp instruments in oil at 250° F. and 18 autoclave them at 10 lb. (no temperature given) for ten minutes while only 1 uses the 27 oven at 170° C. for

at 15 minutes. Eleven institutions use chemical solutions for from three to twenty minutes: 1 uses glycerol-cresol, another glycerol and carbolic acid; 2 employ lysol and alcohol in a proportion of 1:2 and 10 use pure carbolic acid followed by rinses in alcohol for a period from three to thirty minutes.

Six institutions labor under the belief that alcohol sterilizes instruments and use concentrations of from 50 to 95 per cent; however it is well known that anthrax spores survive all concentrations of alcohol for more than one hundred and ten days. This was known to Robert Koch in 1881. Absolute alcohol and alcohol in less than 50 per cent concentration are practically useless. Kuhn and Dombrowsky (1932) found sporulating organisms in more than half of the samples taken from alcohol (70 to 96 per cent) used in clinics and hospitals at Gießen. The fallacy of depending upon alcohol was well illustrated in the report of Nye and Mallory concerning an outbreak of *Clostridium welchii* infections following operations in which the instruments had been washed in hot soapy water rinsed in scalding water and immersed in 70 per cent alcohol.

Lysol is used in 3 institutions and 1 uses 5 per cent carbolic acid followed by an alcohol rinse. Six per cent employ pure lysol; 2 use 20 per cent lysol; bichloride of mercury and 1:70 per cent alcohol and soda soap.

Finally 2 boil their instruments for three minutes and then immerse them in 10 per cent lysol.

It is a deplorable state of affairs and the same, although to a lesser degree, can be said of surgical dressings, rubber goods, and glassware.

Brewer recently stated that 71 per cent of dentists advocate chemical sterilization of instruments. Of these 63 per cent employ a mercurial (metaphen potassium, mercuriodide, mercur, mercurio mercabohide or merthiolate); the majority (50 per cent) use metaphen in a 1:2500 dilution. The time of exposure varies greatly. However they state that from ten to thirty minutes is a required minimum.

Brewer noted further that 1 per cent of the knife blades used in 120 surgical operations carried spore bearing anaerobes. These results again emphasize the immediate necessity for a better understanding of the term sterility and standardization of procedures by reasonably fast and efficient methods.

Bacteriologically, the problem is not at all complicated. Sterilization can easily be accomplished by the employment of mixed, dried, and powdered garden soil which carries aerobic as well as anaerobic pathogenic spore-bearing or-

ganisms. According to Sobornhelm and Masdel, finely powdered soil heated in streaming steam at 98 or 99° C. requires 6 to 8 times as long for complete sterilization as did a like number of spores derived from the same soil by culture. Spore suspensions prepared from soil and mixed sterile soil proved to be more resistant than culture spores similarly treated. Dried and powdered soil therefore offers a simple means of checking and standardizing technique in the hospital routine.

It was found that 1 gm. of soil per liter of water survived a boiling period of two hours, while 0.1 gm. of samples became sterile at the end of one hour and fifteen minutes. However boiling of the soil in an alkaline 2 per cent soda water rendered it sterile in five minutes. When lubricated instruments were contaminated with powdered soil a period of ten minutes was necessary to complete sterilization. It was noted that the addition of formalin gave no advantage over the soda alone and formalin led to the liberation of irritating fumes.

Soda has been extensively used in Europe. Sobornhelm reported that earth spores were readily destroyed by boiling in soda water for periods ranging from ten to twenty minutes. The same was advocated by Walbum at Copenhagen. Syringes, however, cannot be boiled in such alkaline solutions.

It was not possible to duplicate the work of Walbum with 0.5 per cent borax and 0.05 per cent hydrogen peroxide, and this applies particularly to the sterilization of lubricated instruments in less than one hour and forty-five minutes. A mixture of 1 gm. of soil to 450 c. cm. of 5 per cent cresol yielded growth after twenty-four hours of exposure provided the sediment was washed thoroughly prior to cultivation. This fact clearly demonstrates the ineffectiveness of cresol solutions. Most of these compounds (cresol solutions) have low phenol coefficients 2-5. Commercial cresol also contains benzophenol, which is rapidly absorbed by human tissues and possesses great toxicity. Lysol fails to kill the spores of the anthrax bacillus or of *Clostridium botulinum*. These solutions are effective against tuberculous bacilli.

In our experience lindol (tricresyl-phosphate) which is employed for heat sterilization of instruments at from 170 to 175° C. and takes a period of 5 minutes, eventually breaks down and leaves a tarry deposit. If water is added a precipitate of cresols may form and phosphoric acid is liberated. The lindol then becomes most irritating.

Another common agent is potassium-mercuric-iodide. It is employed in a 1:5000 solution, a solution in which it is maximally ionized. In spite of this fact, it was noted that 86 of a total of 107 hand-brush jars were contaminated with various organisms including a *Pseudomonas* (pyocyaneus). A curious fact was that the same solution killed this isolated strain of the organism. Upon further study it was learned that potassium-mercuric-iodide does not destroy the organisms attached to surfaces like those of rubber, glass, hair, gauze, paper, and wood. On silk or metal (Mitchell clips) they were killed. It was also found by conductivity measurements that the compound was highly dissociated in the 1:5000 solution, as generally used, and that the total number of HgI_2 ions per c. cm. was too small to destroy the organisms fixed on surfaces. Usually, organisms are attached to dust particles or cellular debris. With this fact in mind the surface tension of the solution was lowered in order to increase the number of HgI_2 ions in the surface films according to Gibbs adsorption equation. It was then discovered that the soap markedly increased the activity of the mercurial and that the same thing could be accomplished by increasing its concentration. However, even under these conditions it proved ineffective against organisms dried on wood.

Brewer recently pointed out that dental burrs and surgical blades are not sterilized by a large series of the newer mercurials, i. e., when these instruments are artificially contaminated with spores of pathogens. The spores were not even killed in the absence of proteins of body fluids. However, they are often inhibited in such a manner that they do not produce infections. It should be understood that Brewer employed large quantities of spores and in all probability in amounts out of all proportion to the total number of mercurial ions present per unit of the solution, as was found by us in the case of potassium-mercuric-iodide.

From these findings it must be assumed that the question of sterilization of surgical instruments by mercurials is not at all settled.

Another generally employed agent is formaldehyde gas. This gas has found considerable application in the sterilization of catheters and cystoscopes. However, unless the instruments are exposed for prolonged periods of time sterility cannot be expected. Penetration of the gas is often impeded by layers of muslin, and condensation of the gas readily occurs. Instruments contaminated by garden soil and exposed in the usual cystoscope boxes to the gas for thirty min-

utes showed growth. However, if the gas can be forced through by a 40 mm. reduction of pressure, sterility can be obtained in a short period of time (thirty minutes). This was accomplished in a modified pressure cooker in which 3 electrical heating units were inserted. A finely perforated disk separated the electrical elements from the main body of the tank. The evaporation of 1 tablet was found to be insufficient but 2 or 3 tablets induced sterility in about thirty minutes. When the pressure was not reduced organisms like the staphylococcus and colon bacillus survived exposure of the gas liberated from 2 or 3 tablets of formaldehyde tablets. Moisture on the instruments slightly improved the effectiveness of the gas.

The use of formaldehyde gas under partial vacuum has not received sufficient attention. Under ordinary conditions, however, long exposures, a high concentration of the gas, a high temperature, and a maximum degree of humidity are prerequisites for its effectiveness, but these factors are never considered in routine hospital technique.

Chlorine as a gas has never found much use because of its extreme irritation, generally, chlorine compounds lose a great part of their effectiveness in the presence of organic matter, and chloramine compounds are less active germicidal agents.

Recently, Hettche in Germany reported on the effectiveness of "quartamon," a chlorbenzylic compound of the higher alkylamids of dimethyl-amino-aceto-acetic acid. The compound has a pleasant odor and does not corrode. Hettche claimed that a 2 per cent solution sterilized instruments in about ten minutes. However, when organic materials were present it took one hour to accomplish sterilization, and soaps affect the compound. No work was done with pathogenic spore-bearing organisms.

Zephriol is another compound of this type with claims of effectiveness not only against the ordinary organisms but also against the spore-formers as well. It attacks rubber goods.

There are many of these agents on the market, namely, lavasteril, sagrotan, baktol, bacillol, chlorvarn, optiform, but little or no work exists to justify their general employment.

I wonder if we are really a long way from the days of the laudable pus and phenol sprays as far as our chemical sterilization technique is concerned.

Many of our agents are effective under laboratory conditions, but too often practically ineffective under other clinical conditions. The

phenol coefficient values as ordinarily determined are of little value in practice.

The ideal chemical should operate in the presence of organic matter. It should have a low toxicity, a low temperature coefficient, the power of penetration, a low surface tension, velocity of action, solubility, homogeneity, stability, detergent properties, and chemical compatibility and

should be non-corrosive, odorless, free from undue specificity and low in cost.

The purpose of this discussion was to excite your interest in this matter and to beg you to consider a system of standardization of technique. At present we must rely entirely on heat for the accomplishment of sterility, since there is only sterility and no relative sterility.

CAN GERMICIDES BE RELIED UPON TO STERILIZE CUTTING EDGED INSTRUMENTS?

EARLE H. SPAULDING, Ph.D., Philadelphia, Pennsylvania

THE summarized data presented by the writer has recently appeared in print (*Surge., Gynec. & Obst.*, 1939, 69, 738). A laboratory procedure with extremely contaminated knife blades was used to determine the bactericidal power of 7 representative solutions used for this purpose. Ethyl alcohol, phenol alcohol, soapy solutions of low surface tension, and heavy metal and formalin solutions were included. It became evident that even in the presence of blood and pus, knife blades could be rapidly sterilized by these solutions *provided no spores were present*.

The introduction of bacterial spores, however, changed the sterilization time from a matter of minutes, or even seconds, to one of several hours. In fact only the solutions containing formalin succeeded in destroying tetanus spores within

eighteen hours. Other types of spores were less resistant, but it was obvious that an overnight exposure in the germicide was required for safety. Even then only the formalin solutions were found to be satisfactory.

A number of germicidal solutions, not mentioned, have been investigated. None, however, has been found better than, or equal to, the formalin solutions.

A limited number of tests with hinged instruments have demonstrated that the sterilizing time is at least double that for knife blades.

It should be noted, however, that all these tests were conducted without previous cleaning of the instruments. Experimental data support the view that cleaning of instruments before immersion in germicide results in such a marked reduction in the sterilizing time that chemical sterilization of knife blades with certain germicides is both practical and efficient.

From the Department of Bacteriology and Immunology, Temple University School of Medicine, Philadelphia, Pennsylvania.

ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Glaser, M A , and Blaine, E S The Fate of Cranial Defects Secondary to Fracture and Surgery A Follow-Up Study of 150 Patients *Radiology*, 1940, 34 671

In order to prognosticate the fate of cases of cranial defects following trauma and surgery, 150 patients were studied by periodic cranial x-ray examinations. Careful attention was paid to duplication of the original x-ray technique for comparison. The medicolegal as well as the clinical value of such a study is apparent.

The healing of linear fractures depends upon the age of the patient, the width of the fracture line, and the location of the fracture in the skull. It is possible that a biochemical process occurs in some skull fractures similar to that which may be a factor in delayed or non-union of fractures of the long bones. The disappearance of linear fracture lines occurs much earlier in children than in adults. In a group of 8 children, fading of the fracture line became apparent within two months after injury and all but 1 of the fractures disappeared within six months. In adults, the earliest time for fading was within seven months, while the disappearance time was extremely variable. Fractures in the occipital region were much slower to disappear than those in other parts of the skull. Some occipital fractures were visible over an eight-year period. In 4 patients, instead of a healing, a widening of the fracture with absorption about the edges occurred. These were cases of extensive separation to begin with, although in some cases of wide separation healing occurred.

In a group of depressed fractures without operative elevation, the fragments fused in from ten to fourteen months. When the depressed fragments were removed by operation and a defect in the skull remained, the defect did not decrease in size but a rounding of the serrated edges occurred within eight months. If depressed fragments were replaced and the edges of the fragments were not approximated, or if bone dust was not used to fill up the spaces, x-ray evidence of separation was maintained up to five years. On palpation, however, the surface always felt as if solid bone were present.

For the operative replacement of depressed fragments the authors describe a catgut screen which they use to maintain the fragments in position. The introduction of silver plates was found to be extremely dangerous, whereas the use of osteoperiosteal grafts taken from the skull proved to be simple and most satisfactory for the closure of cranial defects. Complete calcification required a period of from five to eight years.

Osteoplastic bone flaps turned down for the removal of brain tumors or other intracranial lesions undergo various changes. In infants these wounds heal completely without signs of operative procedure. In adults the bone flap may appear normal, or it may undergo calcification within the center of the flap. The edges of the flap and the burr holes may disappear if the edges are closely approximated and bone dust is placed in the burr openings.

JOHN L. LINDQUIST, M D

Morrison, L F, and Schindler, M Cavernous-Sinus Thrombosis. Report of Recovery Following Sulfapyridine Therapy. *Arch Otolaryngol*, 1940, 31 948

The authors report a recovery following thrombosis of the cavernous sinus.

Sulfapyridine was used as a chemotherapeutic agent, a total of 63 gm (945 gr) was administered. Excepting mild cyanosis, no subjective or objective reaction to the drug was observed.

The diagnosis of thrombosis of the cavernous sinus was made on both clinical and laboratory findings.

JAMES C BRASWELL, M D

Lynch, D F Osteomyelitis of the Jaws. *Am J Orthodont & Oral Surg*, 1940, 26 584

Osteomyelitis is usually caused by a mixed infection with the staphylococcus predominating. The resistance of the patient, the virulence of the invading organism, the traumatic injury, and the environment are factors in the development of osteomyelitis of the jaw. When congestion of the soft tissues of the jaw is not relieved, osteomyelitis may follow, especially when the congestion is in contact with bone for a period of time without drainage. A conservative method of treatment is indicated in most cases, although one must watch the case carefully for signs and symptoms of pus, within the mouth or without. It is often best to cut away tissue so as to create a gaping wound in order to insure free drainage and proper aeration. Drains should be allowed to remain long enough to accomplish their purpose. In osteomyelitis of the jaws, the process may be a simple one or it may extend and involve the whole jaw. When the teeth are loose enough to be an irritating factor, they should be sacrificed. Immobilization of the mandible is helpful.

A detailed report is given of a case in which there was a complete loss of structure involving the head of the condyle and in which the patient regained complete function and thorough use of his jaws. The entire ramus was lost and a new ramus was developed with all the anatomical landmarks in the roentgenographic plate. In this case the conserva-

tive type of treatment as followed and after the sequestrum was removed, the jaws were wired into position so as to retain the normal relationship of the teeth. There was extremely large amount of bone lost in this case. There has apparently been a regeneration of new ramus with all the original anatomical characteristics such as the angle, the mandibular canal, sigmoid notch, and mandibular sulcus.

RICHARD J. BRODIE, J. M.D.

EYE

Bair, H. L.: Some Fundamental Physiological Principles in Study of the Visual Field. *Arch. Ophth.* 940, 24, 2.

Study of the visual field is preferably classified as (1) topographic and (2) quantitative the former dealing with the shape and extent of field defects and the latter with their density. Either may be achromatic or chromatic according to whether white or colored test stimuli, respectively are employed. Field study in the presence of uncorrected ametropia and refractive aberrations is more reliable with the use of larger test stimuli and lower levels of adaptational, background brightness.

A new method of examination, depending on the use of selected low level of adaptational, background brightness is presented. This is more delicate and accurate than the ordinary method of examination at relatively high levels of light adaptation and minimizes certain technical difficulties in refined examination. No evidence is found to the belief that affection of the epithelial layers of the retina causes selective affection of blue perception whereas affection of the neural conducting system causes selective affection of red perception.

Shimkin, N. L.: Ophthalmic Injuries in War. *Brit. J. Ophth.* 940, 4, 205.

The present war has taken on the character of trench warfare. The experience of the World War showed that on the Western Front eye injuries increased and even three times during the period of trench warfare comparison with the preceding period of open warfare (Darier).

Trench warfare consists mainly of artillery activity which, directed against fortifications, inflicts wounds not only through fragments of bomb, shell, and shrapnel but also by innumerable splinters of stone, cement, and sand. These splinters, indirect projectiles, accompany every explosion and, having acquired great speed, cause injury to the globe of the eye no less dangerous than that of the shell fragments. However according to my own observations, the most destructive agents of the visual organ are rifle and machine gun bullets which cause mainly transfixing wounds of the head, orbit and of the eye itself.

The author gives the results of his observations of 38 cases of eye injuries at the Chief Casualty Clearing Station and over 303 cases in base hospitals. He describes some of them by means of his

stories of the injuries, and photos and drawings of those cases of eye injuries which are not seen in peace time. He discusses difficulties in diagnosis, treatment and prognosis for the sake of those combat who did not take part in the last World War.

He examines the character of the explosive action of bullets or other gun shot missiles in wounding the orbit and stresses the enormous kinetic energy developed. He points out that the real destruction of the orbit and its contents is much more extensive than that is observed on examination of the external wound. All orbital wounds in which the missile passes over the arcus syngneticus should be considered as cranial in character. By these injuries the upper wall of the orbit, meninges, and the brain are wounded.

On the basis of numerous ophthalmoscopic and clinical observations he considers that concussion of the eye and brain is nothing but the disturbance of their vascular system. The severity of concussion is in direct proportion to this disturbance, which may result in varying degrees of degeneration of the nervous tissue of the retina and cortical visual centers.

Among 60 wounded there were 23 eye injuries and 34 injuries to the head. Rifle bullets gave two-thirds of all of the orbital and all of the eye injuries penetrating through and through. One-third of such wounds were inflicted by artillery fire. A patient suffering from eye wound stayed in a hospital on an average of forty-six and eight-tenths days.

The eye injuries in the war are accompanied by dense adhesions of the sclera and the destroyed choroid to the underlying tissue, which greatly increases the difficulty of enucleation of the globe therefore the author suggests that such cases of eye injuries should be sent to a center where there is an oculist. The fear of sympathetic ophthalmitis is exaggerated the author has seen only one case of sympathetic irritation which occurred on the twenty-sixth day after the patient had been wounded.

150 of 200 cases of eye injuries as eye had to be enucleated. Among 60 cases of eye injuries and concussion an average of 77 men lost the sight in one eye and .8 in both eyes. The present war threatens to produce a still greater number of blind than the last war as in trench warfare the head, face, and hands are more often wounded than in open warfare.

LESLIE L. MCCOY, M.D.

Bothman, L.: Glaucoma Following Irradiation. Pathological Report. *Arch. Ophth.* 940, 2, 92.

The case of a man aged sixty-two years, who had received large doses of roentgen rays and radium without adequate protection and who subsequently developed unilateral glaucoma, is reported in detail. Histological study showed thinning and destruction of the corneal epithelium and some damage to the endothelium, atrophy of the ciliary processes, and marked dispersion of pigment from the ciliary processes and posterior surface of the iris, with blocking of the spaces of Fontana and the anterior surface layer of the iris, which resulted in glaucoma.

SURGERY OF THE HEAD AND NECK

Invasion of the sclera and choroid by a squamous cell carcinoma was thought to have occurred late in the disease and not to be a factor in the production of the glaucoma.

The fact that the blood vessels were little changed from those of a patient of the same age with normal tension indicates that vascular changes played no rôle in the glaucoma. It is assumed that the pigmentary change noted was a direct result of the radiation. In the 3 previously recorded cases, similar alterations in the uveal pigment were noted.

WILLIAM A. MANN, M.D.

Brooks, W. D. W., Juler, F. A., and Williams, E. R.
The Relationship between Chronic Iridocyclitis and Tuberculosis, and the Appropriate Therapy. *Brit. J. Ophth.*, 1940, 24, 317.

The outstanding finding which emerges from the study of 40 cases of chronic iridocyclitis is that in a high proportion clinical and roentgenological evidence was found suggestive of the presence of tuberculosis elsewhere in the body.

The 40 cases in this series had in common a chronic ocular lesion, but otherwise they were unselected. The fact that 25 of them showed evidence suggestive of tuberculosis on clinical and roentgenological examination is therefore beyond the limits of coincidence, and strongly supports the view that chronic iridocyclitis is caused by tuberculosis. The authors are of the opinion, furthermore, that the very considerable difficulty in isolating the organism, not only in cases showing typical chronic pulmonary tuberculosis, but also in those in which widespread dissemination had occurred, is itself of the utmost significance in regard to the pathology of chronic iridocyclitis.

The authors are of the opinion that all these patients were particular examples of what may be called chronic disseminated tuberculosis, and that the occurrence of either parotitis or iridocyclitis, or both, is nothing more than an incidental feature of a generalized disease. The extent and severity of the disease would seem logically to depend on the number and virulence of the organisms discharged into the blood stream, and also upon the allergic condition and immunity of the patient at and after the time when dissemination occurs. In this group particularly, allergy was shown to be, as a rule, relatively low, while the clinical course indicated a very high degree of immunity. It is suggested that this finding and also the difficulty of demonstrating the organism in spite of every endeavor, may be due in these cases to the fact that when dissemination occurs these organisms are already dead, or of such low virulence that local necrosis and caseation is found to be entirely absent or relatively slight in the metastatic lesions.

In these patients particularly the differential diagnosis includes Schurmann's disease and Boeck's sarcoid. In regard to the former (chronic miliar tuberculosis with lymphangitis reticularis), sufficient pathological evidence exists, and was indeed pre-

sented by Schurmann himself, to prove the tuberculosis etiology conclusively.

The latter syndrome was thought to be a localized form of tuberculosis. More or less widespread visceral lesions were shown to accompany the disease by Schurmann, and gradually an ill defined group of disorders, including lupus pernio, lupus miliaris, angiolupoid, erythrodermia sarcoidique, cystoid formation in small bones, and uveoparotid fever, have been tentatively incorporated in the syndrome which is now known as sarcoidosis. It has become realized that sarcoidosis is a generalized disease of the reticulo-endothelial system, and that it affects particularly the lymph structures, the spleen, liver, skin, eyes, bones, lungs, salivary glands, and the central nervous system. Its outstanding features are those of a chronic recurrent toxemia, a low or complete insensitivity to tuberculin, an absence or paucity of caseation in the lesions which have otherwise a histological structure closely similar to that caused by tuberculosis, and, finally, the characteristic that tubercle bacilli cannot usually be demonstrated within the lesions.

While the cause of sarcoidosis cannot be said to be a matter of certainty, in the authors' opinion the available evidence suggests that the disorder is a manifestation of disseminated tuberculosis. The hypothesis that in these cases moribund or dead tubercle bacilli pass into the circulation and give rise to the generalized lesions would well explain the particular features of this disorder.

Consideration of the Mantoux reaction in the patients of this series is of especial interest when regard is paid to the dilution at which a positive result was obtained. It was noteworthy that when evidence of gross disseminated tuberculosis was present the Mantoux reaction tended to be either negative or positive only in the more concentrated solutions. This was true also in regard to the cases showing chronic pulmonary tuberculosis, for in these, widespread lesions were frequently associated with evidence of relatively low allergy, while sparse lesions often gave strong positive Mantoux reactions to the most dilute solution of tuberculin used.

In the group in which no clinical or roentgenological evidence of tuberculosis existed outside of the eye, the Mantoux reaction was, as a rule, strongly positive in the lower dilutions, which suggested that in these patients tuberculo-allergy was frequently high. Woods, Burke, and Friedenwald have recently shown that cutaneous sensitivity to tuberculin gives a fairly reliable index of the degree of ocular sensitivity, and, on this basis and in view of the reports of Rich and his associates at Johns Hopkins University that allergy and immunity are two distinct processes they have recommended that if tuberculin be used in the treatment of ocular tuberculosis it should be used with a view to desensitization rather than with a view to producing perifocal lesions which might themselves produce immune bodies. Our findings are in entire agreement with such a concept.

LESLIE L. MCCOY, M.D.

Terry T. L. Malignant Melanoma, So-Called Sarcoma, of the Urea. Extension into the Optic Nerve. *Arch Ophth* 94, 2: 205.

Malignant melanoma does not involve the optic nerve frequently. Its relation to the optic nerve is of clinical importance however because the growth can extend along the nerve into the cranium. In a series of 94 cases of malignant melanoma the neoplasm had invaded the optic nerve in only 5 instances. It is the author's opinion that metastasis of malignant melanoma to the eye, and especially to the optic nerve is rare and is present only when generalized metastasis has occurred, in which event the liver is likely to be involved. Malignant melanoma can reach the optic nerve by the following routes: (1) from the choroid by extension along the retina, (2) by direct extension into the optic nerve through the border tissue of the intraocular canal of the optic nerve, and (3) by metastasis. The neoplasm appears to grow toward the brain more readily along the nerve itself than along the intervaginal space and the meninges. Intracranial extension gives rise to increased intracranial pressure with defect in the temporal field and later blindness of the uninvolved eye. It can be prevented by removal of a sufficiently long piece of nerve which may include the interosseous and intracranial portions of the nerve.

Enterotomy of orbital tissue must be done if there is any possibility that viable tumor cells have been spread through orbital tissue at the time of the original operation. JOSEPH E. NARA, M.D.

EAR

H. Gibson, W. A. Summary of Round Window Graft Operations Performed for Deafness. *Ann Otol Rhinol & Laryngol* 94, 2: 334.

H. Gibson briefly reviews the history and experimental background of round-window grafts in the surgical treatment of deafness. In a series of 55 carefully controlled cases he finds that infection has never occurred as a result of the approach to the round window niche through the incision of the tympanic membrane. The round window membrane has not been ruptured, as evidenced by complete absence of postoperative vestibular symptoms. During the period of direct observation, possible only with magnified binocular vision and brilliant illumination, the graft has never failed to remain fixed in the round window niche. This represents an interval well beyond the time when normal tissue grafts might have failed to take, and although from their newly applied position.

Improvement in hearing fulfilling desirable standards has been obtained following round-window graft operations. The series has been small, but has extended over a period of three and half years. When cases are selected according to the criteria which the author enumerates and when the surgical procedure is carried out as described, the operation is devoid of any serious immediate risk, and in no

instance has there been any late complication. The applicability of the procedure apparently is limited only in the age group above fifty years and in cases in which hearing losses are greater than 30 decibels in the speech frequency range. It is hoped that the scope of the operation may be extended to the age group in the second decade, after the hearing loss has reached a relatively static level.

N. AND D. FARRINGTON, M.D.

McCaskey C. H. Pseudonanthomatosus Tumor of the Stenoid. A Résumé of Lipoidosis. *Arch Otolaryngol* 94, 3: 933.

The author describes a condition appearing as a hemangioblastoma with pseudonanthomatosus change and discusses briefly the present-day knowledge concerning the various lipoidosis.

A case in which tentative diagnosis of hemangioblastoma with pseudonanthomatosus change was made is reported.

The pathological observations in the reported case are compared with those of reliable authorities.

It is noted that surgical removal of such growths often proves difficult or impossible.

Consideration of the literature concerning xanthomatous pathology prompts a review of the "lipoidosis," a suitable term because all the conditions falling into this group have some underlying disturbance of lipid metabolism.

Xanthoma ruberum is described as a form of localized lipoidosis and its causative factors are reviewed.

Xanthomatosis is a more common form of generalized lipoidosis. As to its cause, perhaps the best one can do is to hypothesize that a lipid imbalance between certain cells and the blood stream or disturbance in lipid metabolism, either local or general, accounts for the characteristic pathological condition. JOHN C. BRADWELL, M.D.

NOSE AND SINUSES

Frank, I., and Elabd M. Pyogenic Granuloma of the Nasal Fossa. *Arch Otolaryngol*, 94, 3: 99.

The authors have based their studies on the examination of so-called bleeding polyps of the nasal fossa, in an effort to determine whether these growths are non-specific edematous polyps associated with dilatation of the vessels, secondary hemorrhage and fibroangiomas, or whether they may be classified as pyogenic granulomas. As far as the literature is concerned, no general agreement as to their nature has been reached.

The prominent inflammatory features of these polyps—the presence of extensive vascularity—bring to mind the granuloma pyogenicum, a strictly dermatological entity.

The clinical similarity of these lesions is striking. They grow to be rapid and often painless. Hemorrhage is a usual symptom, and bleeding occurs on the slightest contact. Purulent discharge is frequent with both types, and recurrence after removal

is likewise a factor common to both. Lesions of both types vary from 0.3 to 2 cm in diameter. They are bright red, blue-red, or brownish red. Both are frequently eroded and may be sessile or pedunculated.

The incidence of bleeding polyps of the nasal fossa resembles that of granuloma pyogenicum. Either lesion may occur in all age groups. It has been stated that bleeding polyps of the nasal fossa have a predilection for females. However, in a series of cases chosen at random from the literature, the division is approximately equal between the sexes.

Histologically, the lesions in all 5 of the authors' cases were identical with bleeding polyps of the nasal fossa (most of which were diagnosed as nasal fibrovascular tumors), as well as with pyogenic granulomas, both of which have been reported in the literature. The granuloma pyogenicum is a structure usually bordered by a layer of epithelium. It is superficially ulcerated in about one half of the cases, and consists of young connective tissue and young blood vessels. The blood vessels may be so large and numerous as to suggest an angioma. The inflammatory reaction, which consists of infiltration of polymorphonuclear leucocytes and mononuclears, is not invariably present.

Therefore, bleeding polyps should not be classified as fibrovascular tumors even though their blood vessels present an angiomatous appearance and they do not show diffuse inflammatory infiltration. Apparently, they are pyogenic granulomas.

In view of all that has just been said, it is recommended that the term "bleeding polyp of the nasal fossa" be discarded. It is inexact and categorical, and refers merely to a symptom rather than to the type of underlying lesion. The evidence discussed in this study makes it seem probable that many an easily bleeding, painless, rapidly growing polyp of the nasal fossa, composed of young connective tissue and blood vessels, with or without infiltration of inflammatory cells, is a pyogenic granuloma.

JOHN F. DELPH, M.D.

MOUTH

Rigg, J. P., and Waldapfel, R. Lymphangiomas of the Tongue. *Arch. Otolaryngol.*, 1940, 31: 966.

The origin and pathogenesis of lymphangioma of the tongue is suggested by a study of 2 patients with this condition. In one case a diffuse lymphangioma could be traced to early youth. In the other case two separate areas of lymphangioma without communication are described. Microscopic examination showed no evidence of trauma or inflammation. A congenital origin appeared to be the most likely explanation for the origin of these tumors.

The occurrence of two separate lymphangiomas on the same tongue is of interest concerning the favorite site for the development of this tumor.

In the embryo the tongue develops in the third week from an anterior anlage coming from the

mandibular arch, from bilateral thickenings, and from a posterior paired anlage from both hyoid arches. The line of fusion between the anterior and the posterior anlage is marked in the adult by a V-shaped furrow along the line of the circumvallate papillae, in the apex of which lies the foramen cecum. It is interesting that both lymphangiomas of the same tongue were lying within the limits of fissures in the embryonal development. The large main lymphangioma was limited medially by the central line of fusion between the two thickenings of the anterior anlage and posteriorly by the embryonal fissure between the anterior and the posterior anlage of the tongue. While it spread slowly against the latter, the mass ended sharply at the former with overhanging walls. The same was true of the small mass on the inferior surface of the tongue. It also originated from the central line of the tongue, but remained smaller and did not extend farther posteriorly. It is assumed that there is some developmental arrest along the border of the embryonal tissue of the arches and that sometime during life this tissue takes on the peculiar lymph-vessel change and forms lymphangiomas which are specifically confined within definite boundaries. This observation of a double lymphangioma on the same tongue significantly supports the theory of the fissural development of lymphangiomas and of their embryonal origin.

The lymphangiomatous tissue substitutes for the normal lingual tissue. The enlargement of the affected areas of the tongue, the macroglossia, is not brought about by hypertrophy of the lingual muscle fibers but by augmentation and dilatation of the cavernous lacunae.

The lacunae in the cases described are filled partially with lymph and partially with blood so that the name "hemolymphangioma" would be justified. The cavities were histologically, almost without exception, dilated lymph vessels, and those which were filled with blood did not look different from the others.

The diagnosis of these tumors is confirmed or supported by the macroscopic picture of the "histers" and the microscopic picture of the lacunae. In the differential diagnosis sometimes a malignant tumor might be considered, but such a growth is easily differentiated from lymphangioma by the history, the course, and the histological examination.

The prognosis is usually good, however, the frequent injuries to which the enlarged tongue is exposed cause a permanent danger of infection, and even with apparent freedom from symptoms, treatment is advisable.

The therapy of choice is radical excision if one is dealing with small, circumscribed tumors. With extensive, diffuse tumors the entire mass cannot be removed, but it is possible, by a combination of several excisions of wedge-shaped sections of tissue in different directions, to reduce the tongue so much that it has space in the oral cavity. Ignipuncture and radium therapy for such tumors have not proved as

successful as they have for those of the blood vessel type. M. VUET E. LACROIX M D

NECK

Smith J E. Retropharyngeal Abscess with Reference to Abnormally Large Percentage of Cases. *Ann. Otol. Rhinol. & Laryngol.* 940, 49 490.

The high mortality rate of retropharyngeal abscess is appalling. Many of the cases reported in hospital records are tonsillar or peritonsillar abscesses that is, their cause and anatomy have to do directly with tonsillar and peritonsillar tissue as differentiated from retropharyngeal tissue.

Twenty cases of retropharyngeal abscess with mortality rate of 30 per cent, are reported in patients whose ages varied from eight months to sixty years. The occurrence of the abscess was practically the same in both sexes: there being 1 male and 9 females (3 children and 7 adults). Death occurred in the cases of 3 children and 3 adults.

The pathology, complications, and treatment of retropharyngeal abscess are the same in both adults and children; however there is often difference in its cause, particularly with relation to tuberculous and foreign bodies. Retropharyngeal abscess is much more prevalent in children than in adult. Head colds, rhinitis, laryngitis, nasopharyngitis, otitis media, Waldeyer's ring, with lymphatic drainage to the deep cervical and retropharyngeal lymph nodes, are predisposing factors. Still another cause is the marked nasal blockage brought about by hypertrophied adenoid tissue. Many cases of retropharyngeal abscess of the antrum have been reported, and, in children, upper respiratory infection is usually present. In the adult tuberculous must first be considered as causative factor.

In the child, the symptom picture should be thought of somewhat differently than in the adult. In the adult, the symptoms and signs all point to the cervical region. In the child, he does not complain so quickly the symptoms may be very misleading.

In children, most cases are complicated by acute infections of the upper respiratory tract and the onset may be insidious. There may or may not be elevation of temperature; there may be croupy cough and some interference with breathing and swallowing especially in young child. The evidence of nasal obstruction, if the abscess is located high, and of regurgitation through the nose, dysphagia, odynophagia, dyspnea, quick cry or altered voice, stertorous breathing, and retraction of the head when the abscess is situated low are danger signs. Inattention, anorexia, and rapid loss of weight do not the lack of food may be prevented. Pain, if any, is deep-seated. There is usually swelling of the glands of the neck on one side or the other; the child may have convulsions, facial nerve paralysis, or suppurative otitis media. If there is any impending dyspnea, the head is often thrown back on inspiration and a marked wheeze is present. There may be

obstructive laryngeal dyspnea. When bloody sputum secretions are present in a child, retropharyngeal abscess should be suspected.

In the adult the symptoms, signs and complaints point directly to a pharyngeal condition. The onset is similar to that of quinsy from which it must be differentiated. The smooth, tense rounded elevation with fluctuation back of the pharyngeal wall, is proof of the abscess. Generally the condition takes from week to ten days to develop, although it has been observed after as short interval as four days from the onset.

Diagnosis is dependent largely upon the history, signs, symptoms, x rays, and the exploratory needle. Usually no difficulty is experienced in making the diagnosis once the symptoms and signs are manifested. It is the complicated and overlooked cases that lead to diagnostic difficulties.

In the well defined, easily diagnosed case in which prompt incision and drainage has been performed, the prognosis is good. However when one examines the complicated cases the high mortality is astounding. The death rate, particularly in the tuberculous type of abscess, is high. Hemorrhage complicating retropharyngeal abscess should be treated by immediate ligation of the external or the common carotid artery or of the jugular vein. In the other series there were cases of severe hemorrhage, both fatal. Another complication is spontaneous rupture with suffocation. There were such cases in this series.

The treatment of retropharyngeal abscess is surgical, regardless of whether the condition is primary or secondary except in the presence of gumma. As a rule, the opening should be intra-oral whenever possible. In the case of tuberculous abscess an external opening should always be made and the abscess should be treated like tuberculous abscesses in other parts of the body but with much greater conservatism. As to the external operation, the route either in front of or posterior to the sternomastoid may be taken. For the internal route the prone position with the use of suction is preferred. General anesthetic is used.

In the early or pre-abscess stages, heat to the neck, moist compresses, arm or hot gargles, promote hyperemia, and short wave diathermy treatment are beneficial. Supportive measures should be instituted. Proper local treatment of the nose and throat should be administered, and suction should be used if accumulated mucus cannot be removed. JOHN F. DILLON, M D

Puppel I D, Kluemper, K. P. and Curtis, G. M. The Effect on Metabolism in Thyroid Disease. *Ann. Surg. Otol. & Laryngol.* 940, 49 374.

The authors ran series of experiments on calcium balance in normal persons and in those suffering from thyroid disease.

Three normal persons were maintained on low calcium intake for thirty days and each developed a negative calcium balance. The authors concluded

that normal persons excrete a certain amount of calcium daily regardless of the intake of calcium

Two patients with non toxic nodular goiter who were maintained on a low intake of calcium showed a negative calcium balance similar to that of the normal controls. Four patients with exophthalmic goiter who were maintained on a relatively low calcium intake had a great increase in the excretion of calcium both through the urinary and gastro intestinal tract. An increased negative calcium balance of from seven to eight times the normal was established. The blood calcium and phosphorus almost invariably remained within the normal limits. These did not simulate the characteristic features of the disturbed calcium metabolism of the usual case of hyperparathyroidism. Feeding an increased amount of iodine to these patients did not produce any appreciable change in the calcium excretion.

The increased feeding of calcium to a patient with hyperthyroidism in similar amounts as for a normal person produced immediate tremendous retention of calcium of ten times the normal quantity and a consequent positive calcium balance was established.

A striking feature of the authors' series of investigations is the definite decrease in the excretion of calcium in cases of toxic nodular goiter when compared to that of cases of exophthalmic goiter. This difference remained even in patients with comparatively similar basal metabolic rates.

EARL O LATIMER, M D

Ganem, J F The Iodine Test in the Diagnosis of Doubtful Hyperthyroidism (El test del yodo en el diagnóstico del hipertiroidismo dudoso) *Rev méd d Rosario*, 1940, 30 569

The author briefly reviews the historical development of iodine therapy in hyperthyroidism. He credits Rilliet with establishing iodine therapy in the treatment of hyperthyroidism in 1860. In 1863, Trousseau erroneously gave a patient tincture of iodine instead of tincture of digitalis with remarkable improvement following such treatment. He was the first to describe the effects of iodine on toxic goiter. In the early part of the present century, Kocher demonstrated the dangers of iodine therapy. Since that time advocates have published statistics to prove that the administration of iodine to patients with hyperthyroidism reduces the metabolic rate immediately and alleviates all clinical symptoms except exophthalmos and goiter.

The author studied 15 patients with some clinical evidence of hyperthyroidism and increased metabolism but in whom the diagnosis of hyperthyroidism was not certain. These cases are reported in detail. Most of the patients were ambulatory but a few were in bed. They were given Lugol's solution, the American formula. A reduction of 15 points in the metabolic rate, the standard established by Means, was considered a positive test. Twelve of the cases gave a positive reaction, and thus confirmed the diagnosis of hyperthyroidism. One case, which gave

a negative reaction, was later identified as a case of hyperthyroidism. The 2 other cases with negative results proved later to be Parkinson's syndrome and nodular goiter without hyperfunction, respectively. Thus, the corrected percentage of positive results was 92.3 per cent.

The author concludes that the iodine test, which is easy to perform, is of great diagnostic as well as of therapeutic value in doubtful cases of hyperthyroidism.

MICHAEL DEBAKEY, M D

Wyndham, N Liver Damage in Thyrotoxicosis *Australian & New Zealand J Surg*, 1940, 9 385

The author made post-mortem studies of the liver changes that occurred in 43 patients who died of thyrotoxicosis. All of the patients were adult females. In 10 the liver weighed less than 1,000 gm. In only 6 did it weigh 1,300 gm or more. There was no relationship between the liver damage and the size of the liver. In nearly every case examined the patient died of a fulminating type of thyrotoxicosis.

In 13 of the specimens the histological findings were only those of passive congestion. There were 10 instances of fatty changes in the liver cells without liver atrophy. There was a great variation in the degree of fatty change. The author could find no correlation between the length and severity of the toxicosis and the degree of fatty change.

In 6 cases there were findings suggestive of early cirrhosis, such as an increased amount of connective tissue in the portal canals, patchy lymphocytic infiltration, areas of regeneration of the liver cells, and occasionally minor degrees of liver atrophy.

In 8 cases there were fatty changes with atrophy, the fatty changes usually being pronounced. In only 2 cases was the atrophy evident on gross examination. In 2 of the 8 cases there was some clinical evidence of liver damage. It should be stated that 1 of these 2 cases was complicated by pregnancy.

The author concludes from his study that the association of thyrotoxicosis and liver damage is less constant than one might deduct from reports based on experimental findings.

EARL O LATIMER, M D

Maxwell, J H Stenosis of the Larynx Due to Paralysis of the Vocal Cords. Treatment by Submucous Resection of the Vocal Cords. Report of Operated Cases. *Laryngoscope*, 1940, 50 452

Stenosis of the larynx due to paralysis of the vocal cords has long challenged surgical ingenuity. At intervals tracheotomy has been supplanted by some plastic procedure designed to produce a more satisfactory end result. A continuous effort has been made to achieve the two prime requisites for satisfactory relief from this condition. A retention of the natural airway and preservation of the voice have been one or both objectives of those laryngologists who have proposed new treatments.

Not all cases of bilateral paralysis of the vocal cords require the surgical reestablishment of an air-

way. Nor is aphonia the inevitable symptom of such paralysis. The disability produced by such paralysis depends upon the position assumed by the paralyzed cord. It is important to realize that the position of paralyzed vocal cord due to recurrent laryngeal nerve injury may change. This likelihood of shift of a vocal cord from the cadaveric to the median position following an insult to the recurrent nerve prompts the laryngologist to keep under closer observation the individual who is moderately inconvenienced with both cords fixed in the cadaveric position. Because of the possibility of these cords returning to the median line, the patient is a potential candidate for surgical relief from an impending dyspnea. The surgical therapy of the condition must be individualized, for it can scarcely be said that every patient with bilateral paralysis of the vocal cords can be adapted to one routine standard surgical operation.

In the past ten years at the University of Michigan Hospital clinic, there have been recorded 20 cases of bilateral abductor paralysis of the larynx. It was found that the largest number of cases was associated with thyroidectomy. In this series there were instances in which an incomplete paralysis was associated with thyroid enlargement. In nearly

5 per cent of these cases the paralysis of the vocal cords was found to have developed on the basis of central lesion.

The majority of these patients had incomplete paralysis or apparently complete paralysis, with the vocal cords lying in the cadaveric position, so that an adequate minimum airway was maintained and surgical treatment not required. In 4 cases following thyroidectomy the paralysis was temporary. In 3 cases of bilateral recurrent laryngeal nerve paralysis following thyroidectomy, an adequate minimum airway was present for nine months, six years and seventeen years, respectively, before embarrassing dyspnea developed. At the time of examination of each of the 3 patients both cords were fixed in the midline. In 3 instances of laryngeal stenosis associated with bilateral abductor paralysis of the vocal cords, submucous resection of the larynx was performed. The operation used in 4 of the cases varied in technique from that described by Hoover in two essentials: (1) the arytenoid cartilage was completely removed along with the process muscularis in an effort to widen the glottic chink, and (2) two-way tube was placed in the larynx following the laryngofissure and left in place from one to three months. C. DE D. FARRAR, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS, CRANIAL NERVES

Sorgo, W. The Diagnosis and Operative Indications of Intracranial Hemorrhage (*Die Erkennung und operative Indikationsstellung bei den intrakraniellen Blutungen*) *Wien klin Wchnschr*, 1940, 1: 105

Intradural hematoma resulting from a rupture of the middle meningeal artery or its branches presents an extended and well known clinical picture. In contrast to the other forms of intracranial bleeding, namely subdural, subarachnoid, intracerebral, and intraventricular hematomas, it is much less thoroughly discussed in the German literature. The prognosis of extradural hematoma is favorable when the condition is recognized in time and treated properly. Complications such as severe brain contusion, skull fracture with the danger of meningitis, or pneumonia associated with prolonged unconsciousness may bring about a fatal outcome. Subdural hematomas are located between the dura and arachnoid. There are several forms and it is not clear whether or not there is a single causative factor. The pathologists speak of a pachymeningitis hemorrhagica interna but there are several other names for the condition in use. Subdural hematoma occurs in from 8 to 14 per cent of all skull injuries, and it is noteworthy that slight trauma is often reported as the inciting cause of the condition. In the strictly traumatic cases it usually results from a tearing of the veins between the cerebral veins and the superior longitudinal sinus. In numerous instances, however, these veins are not the source of the bleeding. The extravasated blood mass becomes organized and in the course of organization an enveloping membrane forms around it. Smaller hemorrhages may be absorbed entirely. The clinical course depends upon the ability of the brain or skull to accommodate the mass, the power of resorption, and the extent of the brain swelling. Symptoms of increased intracranial pressure usually bring the patient to the doctor. Often slight paresis of the face or extremities is apparent. Papilledema is absent in about half of the cases.

In the absence of a history of trauma the diagnosis is difficult. Brain tumors, as a rule, give a longer history, except that in brain abscess or multiform malignant glioblastomas the history may likewise be short. In these two conditions, however, the patient is usually more acutely ill and the disturbance of consciousness due to the presence of the tumor suggests a tumor psychosis. Other conditions which must be differentiated include fat and thrombotic embolism, meningitis and cerebral apoplexy. Idiopathic forms of subdural hematoma run a different course; they may occur in old institutionalized alcoholics. Lumbar puncture does not have much diagnostic value, whereas arteriography helps con-

siderably in the recognition of the condition. Ventriculography reveals a typical but less convincing picture than arteriography.

Treatment consists of evacuating the hematoma. The removal of the entire hematoma including the membrane has been abandoned since such a procedure may result in tearing of vessels leading to the dura and fresh hemorrhage. In the event that arteriography has not been performed and the possibility of a bilateral hematoma has not been excluded, both sides of the skull should be trephined since the prognosis in these cases is very poor with unilateral evacuation. Toennis lost 2 of 20 and Kohlemann 4 of 24 operative cases. In subdural hematoma of the newborn results have not improved either with Cushing's operative treatment or with the less radical aspiration treatment, so that the prognosis on the whole is very unfavorable.

Subarachnoid hematoma results from hemorrhage into the external cerebrospinal fluid spaces. These hematomas lie within a sac made up of pia on the one side and arachnoid on the other. In the majority of cases these hemorrhages arise in arterial aneurysms of various types, especially congenital arteriovenous aneurysms and angiomatous formations in the brain. Under the influence of a change in the blood pressure relationships during puberty spontaneous rupture of these vessels may take place.

Other conditions which raise the blood pressure and may result in spontaneous rupture are alcoholic excess, coitus, and heavy lifting. Especially significant are subarachnoid hemorrhages resulting from trauma to the larger vessels, such as injury to the internal carotid artery by bone splinters, which in the exceptional case may lead to traumatic arteriovenous aneurysm of the internal carotid artery with pulsating exophthalmos. With the onset of a profuse hemorrhage a patient in full health may be stricken very suddenly, but often preceding this event definite prodromal symptoms occur which make a diagnosis of the underlying lesion possible. A knowledge of the symptomatology of this clinical picture before and after the onset of hemorrhage is of great importance. In the majority of cases the lesion is an angioma of the brain. Early recognition alone permits successful treatment, which is feasible only when the tumor is small and its vascular supply remains within normal limits.

Significant insofar as practically proving the presence of congenital arteriovenous aneurysm is the syndrome of subarachnoid hemorrhage, with epileptic seizures and transitory paralysis. Through arteriography we have a means of diagnosing this condition with certainty and of being able to determine the extent of the lesion. In order that the treatment be successful it must be directed to the lesion itself.

In the event of acute hemorrhage absolute bed rest must be maintained which as a rule stops the hemorrhage. Extirpation of the angioma is the treatment of choice and gives good results. If radical removal is not feasible because of the situation and size of the lesion, ligation of the common carotid artery and later of the internal carotid artery will bring about improvement. X-ray therapy has no effect. The most frequent intracerebral hemorrhage is the apoplectic type principally in the internal capsule. Because of the frequency of extensive damage to the brain substance surgical treatment has little to offer even theoretically. In addition these patients are poor risks usually because of their general poor condition. In spite of this a few others have obtained good results with surgical procedures. Schoenbauer had 5 cures in 4 patients in whom the sure, the popliteal nature of the disease was not entirely clear.

Intraventricular hemorrhage results most often from rupture of one of the larger intracerebral vessels rather than of a vessel of the plexus. The extravasated blood is driven by the arterial pressure into the external or internal fluid spaces. The latter event has long been held to mean certain death. However observations in the past year have shown the contrary. These cases do not present any indications for operation.

In conclusion the management of intracranial hemorrhage comprises rather large field of neurological activity. The prerequisite for successful outcome is a correct and timely diagnosis. Arteriography is of first importance and ventriculography is indispensable as an aid to diagnosis.

(Boer) JOHN L. LEVON, M.D.

Short, A. R. and Dunster, M. Traumatic Extracranial Hemorrhage. *Brit J J* 440, 444

The authors present cases of traumatic extracranial hemorrhage and emphasize the inconstancy of the clinical interval and the difficulties in clinical diagnosis and localization of the lesion. The second case illustrates the possible value of electroencephalograph as an aid in localization of the hematoma.

In the first case there was a definite history of 1 day interval, and the clinical course was that of spreading intracranial hemorrhage. At operation, the source of bleeding was found to be the superior

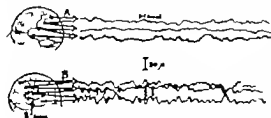


Fig. Electro-encephalogram showing silent area over the hematoma.

longitudinal sinus rather than the middle meningeal artery.

In the second case the history was atypical, the onset of symptoms was late and the course was more indicative of subdural than of extracranial hemorrhage. Neurological signs gave false location of the lesion but an electro-encephalogram showed a silent area over the hematoma apparently pointing to its true location. The accuracy of electro-encephalographic localization has not yet been determined but if the method proves to be accurate it will have distinct advantages over ventriculography and encephalography because of its simplicity and harmlessness.

JOHN L. LEVON, M.D.

Jefferson, G. Extrasellar Extensions of Pituitary Adenoma. *Proc R Soc Med Lond* 442, 11 433.

In the author's words this account has been an attempt to broaden the conventional description and to correct too didactic a formulation of the nature of the pituitary adenoma to account for variations in symptomatology and to give reasons why operation is sometimes, though rarely attended by ill success.

Size is not necessarily an index to the malignancy of pituitary tumor and unless there is either metastatic invasion of the surrounding structures, regardless of size and ramifications, the tumor must be considered benign whatever its cellular structure may be. This is a new concept, and one which may not readily find acceptance in all quarters.

A pituitary tumor is influenced in its development by three factors.

The growth tendency of the adenoma and its nature. Some adenoma grow to certain size and may thereafter fail to increase materially for no obvious reason or they may continue to grow, as in some cases of acromegaly long after metabolic changes have ceased to be apparently progressed. The adenoma may be large, cystic and soft, or it may be tough, meaty fibrous and very vascular the latter type being the most difficult of removal.

The fixation of the chiasm may be of such firmness that there is universal resistance to the tumor and visual changes may be very slow and late in appearing.

The sella and sella diaphragm offer a variety of resistance. The fibrous thickenings of the diaphragm and the dural support offer a more resistance than does the underlying cancellous bone.

Extrasellar extensions may occur into the hypothalamus, the frontal lobe, the temporal lobe and more rarely into the cavernous sinus, here the tumor then demonstrates Jefferson's criterion of malignancy. The author maligns a tumor which is an ink and terms it him a meningioma that tumor which has entered into locations here they could not be if the capsule were intact, though the cell type remains the same as that found in smaller tumors.

JOHN M. MARTIN, M.D.

SURGERY OF THE NERVOUS SYSTEM

Horrax, G. Concerning the Operability and Results of Operations for Brain Tumors *Surg Clin North Am*, 1940, 20 623

The author reports on the operative results of 400 cases of brain tumor. He divides these into operable and inoperable tumors. The former comprise 56 per cent and the latter 44 per cent. It is thus seen that well over one half of all brain tumors can be completely extirpated and in most instances the patients are restored either to their former occupation or to a useful life. The mortality is about 12 per cent for the operable group and about 44 per cent for the other.

The meningiomas, pituitary adenomas, and acoustic neuromas made up the bulk of all the operable tumors, 26 gliomas were also in this group.

The group not suitable for complete extirpation consisted mainly of gliomas and metastatic carcinomas. Included in this group were also a few cases of meningiomas, pituitary adenomas, and acoustic neuromas.

Of the 224 patients included in the operable group, 26 died at operation or soon afterward, which left 198 survivors. A further 10 have died subsequently, which left 188. Of these the follow-up studies showed that 28 have major disabilities, such as very marked ataxia or motor weakness, or blindness. Thus, it is seen that 160 patients from the group of 224 with operable brain tumors have not only survived the operation but have been restored to complete health and useful activity or to a state very nearly approximating this.

Poppen, J. I. The Treatment of Trigeminal Neuralgia. Peripheral Nerve Block. *Surg Clin North Am*, 1940, 20 663

Peripheral nerve block for the treatment of trigeminal neuralgia can be performed in the office. When two divisions of the nerve are involved, each can be blocked at the same sitting. The alcohol injection if successful is immediately followed by a subjective feeling of numbness and other paresthesia. These may be extremely annoying. Normal sensation returns after a few months. Atypical facial pains which simulate tic douloureux are not relieved by these injections. Therefore, it is very important that a definite diagnosis of trigeminal neuralgia be made before injection is undertaken.

Detailed techniques for the injection for the various subdivisions of the trigeminal nerve are given in the article.

Occasionally mild complications occur following the alcohol injection. These are usually hemiataxia, dizziness, and headache. One patient suffered with nystagmus and diplopia. Transitory palsies of the sixth nerve and dilatation of one pupil have been observed.

The most important objection to alcohol injection is that it gives temporary relief only. The patient being aware of this remains apprehensive. Other objections are that the injections are painful and that in certain individuals the nerve cannot be

reached because of scar tissue or abnormal bony protuberance. There are no contraindications to alcohol injection with the exception of local infection.

DAVID J. IMPASTATO, M.D.

Coleman, G. C. Results of Faciohypoglossal Anastomosis in the Treatment of Facial Paralysis. *Ann Surg*, 1940, 111 958

Although any surgery for the repair of facial paralysis leaves much to be desired and a face which is never functionally normal, Coleman is a staunch adherent to the use of faciohypoglossal suture and a well directed reeducational program during the period of regeneration. With the increasing frequency of complete or subtotal removal of cerebellopontine angle tumors and the frequently resulting facial paralysis, this subject is of mounting importance. Faciohypoglossal anastomosis restores movement to the paralyzed muscles, the face assumes a "balance" in repose, and atrophy on the affected side is avoided. Naturally, such anastomoses must be made as early as feasible. During the stage of paralysis the sagging muscles must be supported by adhesive strips, and massage must be religiously employed to maintain tone in them. Maximum results may be expected by the end of two years.

As to reeducation, mass movements and resultant habitual abnormal grimaces are to be avoided by instructing the patient to suppress extreme facial movement and to keep the face in repose (at which time the affected side will in most instances be barely noticeable), rather than to practice attempting to make both sides of the face move in unison in the customary expressive movements. Certain cases of a severe nature may be treated by means of fascial support (Brown 1938), together with nerve anastomosis.

PERIPHERAL NERVES

Fetterman, J. I., and Spittler, D. K. Vascular Disorders of the Peripheral Nerves. *J Am Med Ass*, 1940, 114 275

Syndromes of the peripheral nerves may not only occur as the result of mechanical trauma or specific disease, but also may be due to direct vascular failure of the nutrient supply to the nerve. Such vascular disease, however, mechanical or chemical (arterial trauma), may occur in deep gluteal injections of bismuth, (1) trauma, mechanical or chemical (arterial trauma), (2) embolism, the results of sudden plugging of the nutrient artery varying from ischemic neuritis to gangrene according to the size and location of the embolism, (3) arteriosclerosis and diabetes mellitus, with a profound sensory and pain disturbance as the characteristic neuropathy, (4) thromboangiitis obliterans, the syphilis, because of the obliterative severe pain (5) syphilis, because of the obliterative endarteritis and perivascularitis (6) periarteritis nodosa, which according to Meyer, 1921, is accompanied by "chlorotic marasmus, polyneuritis, and polymyositis," (7) polyarteritis and (8) various

ther states, such as progressive disseminating obliterative arteritis and proliferative tubercle.

In these conditions it can be seen histologically that a typical wallerian degeneration occurs peripheral to the ischemic source.

JOHN MARTIN, M.D.

MISCELLANEOUS

Homans, J. Minor Causalgia A Hyperesthetic Neurovascular Syndrome. *New England J. Med.* 940, 870.

Causalgia, the entity originally described by S. Weir Mitchell, and "minor causalgia," an apparently related but less severe affliction, are still wanting an explanation of their cause and nature.

Homans, throwing them into that hodge-podge 30 per cent of cases difficult to understand and classify points out that the causalgias are as frequent today as they ever were that they may be

largely functional in nature and overlaid by hysterical symptoms that not infrequently they are compensation cases, that most cases do not come to surgery and that they may arise following such trauma as stab wounds, gunshot wounds, lacerations, bruises, major or minor infections following animal bites, fractures, and burns. He is in agreement with Leriche that the sympathetic nerves are basically responsible for the distress, although he cannot describe the exact nature of the dysfunction. It seems most probable that perivascular sensitive fibers

whether lying upon a large vessel or surrounding many tiny arteries, whether in the soft parts or in the midst of a great nerve are able to excite a prolonged, vicious, reflex, sympathetic disorder. He has found that patients are unmistakably relieved or even cured by procaine block of the trigger zone or by interruption of the reflex arc at a favorable point by procaine block or surgical excision.

JOHN MARTIN, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Charache, H Tumors of the Male Breast *Surgery*, 1940, 7 889

Tumors of the male breast are not frequently encountered This author has collected 35 cases These tumors comprise about 2 per cent of all neoplasms of the breast Of all the tumors of the male breast 80 per cent are malignant, the rest benign, and carcinomas comprise 98 per cent of all the malignant tumors

Carcinoma of the male breast differs in many respects from carcinoma of the female breast The age incidence of the male is higher Trauma is said to be a greater contributing factor Male patients apply for treatment later in the course of the disease Pain is a less frequent complaint The nipple is more often involved than in the female and ulceration is present more frequently The axillary glands are involved in more than 50 per cent of the cases Lymphedema of the arm is less common than in the female General and widespread metastases are present more frequently The prognosis in the male is less favorable

Fibroadenoma and gynecomastia comprise 98 per cent of the benign tumors of the male breast They are subject to malignant transformation although they may remain benign for a long time Simple mastectomy is the treatment of choice, no matter how innocent the tumor may appear to be

J DANIEL WILLEMS, M D

TRACHEA, LUNGS, AND PLEURA

Sellers, T H Chest Injuries in Modern Warfare *Practitioner*, 1940, 144 609

Experiences in the Sino Japanese and the Spanish civil wars show that through and through rifle bullet wounds are not likely to be seen Fragments of bomb and shell are seen to produce all other varieties of penetrating wounds with laceration of the vital organs Crushing from explosions and falling masonry have proved just as serious without penetration

A distinctive difference between military and civil surgery lies in the type of patient The soldier is a healthy adult in first class physical condition The civilian may be of any age and in any state of health Thus the civilian on the whole is likely to suffer more

With chest wounds the injury of the casing is of less importance than the damage within The signs and symptoms vary widely with the degrees of shock and hemorrhage present and with the area of lung put out of action One syndrome is common to all chest wounds—shock and dyspnea With penetrating wounds shock is instantaneous the mental condition is unduly active and anxious, with aimless

restlessness and a desire to be sitting up An increasing pulse rate indicates that bleeding is still going on Air hunger, a valuable diagnostic symptom in hemorrhage, is masked by the difficulty in breathing Bursts of coughing exhaust and distress the patient Pain depends on the amount of injury to the ribs So long as the chest is at rest there is little pain, but any attempt at a deep breath brings a sharp stab of pain The respirations are rapid, shallow, and incomplete, rather than deep and labored Bursts of coughing are followed by lividity Cough may be incessant and distressing Blood in the sputum varies from staining to enormous quantities of clot and fluid Bubbling sounds in the air tubes may be heard

When an open pneumothorax is present the lung collapses entirely and air enters and leaves the lung by the external wound with each respiration Sucking and blowing sounds accompanied by frothing blood require urgent attention A valvular opening in the visceral pleura with coughing drives more and more air into the pleural cavity The tension pneumothorax which follows may lead to high intrapleural pressure Unless relieved it may result fatally Nothing can be done for hemorrhage of a large pulmonary vessel It is rapidly fatal External bleeding from any penetrating wound is usually slight The innocent appearance of minute punctures from small fragments of bomb may utterly belie the extent of internal damage Bleeding from lung tissue is usually arrested after a time by the combined effects of collapse and the counter pressure of the pad of blood and air within A pint of blood or more can be borne without undue distress Subcutaneous emphysema is easily recognized It is frequently seen when a rent in the parietal pleura is associated with a pneumothorax With a few bouts of coughing the patient may blow up like a football Pulmonary atelectasis is a common feature in chest injury, with or without penetration Punctured or incised wounds of entrance may appear insignificant, but the exit wound, if present, may show gross lacerations with pieces of bone, clot, bits of cloth, and torn flesh A small exit suggests that no bone has been encountered A simple break in a bone without displacement is not dangerous, but spikes of comminuted or displaced fracture may puncture and lacerate lung tissue and such adjacent structures as the liver, diaphragm, or spleen Large open wounds are always serious, more so in healthy young individuals whose mediastinum is supple and easily displaced Relief of extreme distress is obtained when the external opening is closed Severe crush injuries, "stove-in chest," imply rib fractures in more than one place and may create a flap disunited from the chest wall Crushing injuries may also produce "traumatic asphyxia," Intense cyanosis and petechial hemorrhages under

the skin with subconjunctival bleeding result from forcible suction of blood from the great veins of the chest in a backward direction.

Treatment is most important in the early stage. Severe shock and dyspnea demand morphine and morphine. A propped-up posture is more comfortable. Coughing is facilitated thereby and danger from atelectasis is minimized. As soon as possible careful search is made for wounds. Oxygen is a valuable adjunct to treatment. Its inhalation relieves dyspnea and cyanosis with corresponding improvement in the pulse rate and blood pressure. A pneumothorax does not necessarily require active treatment. Its presence may be beneficial in arresting hemorrhage from the lung. However if the dyspnea is increasing the possibility of a tension pneumothorax should be realized. Relief of excessive intrapleural pressure is obtained by pushing a needle into the sac and letting out the air. It may even be not leave the needle still covered with tenacious gauze.

Internal hemorrhage is difficult feature to assess. An average 6 g injury does not produce hemothorax of such extent as to be fatal. Bleeding usually ceases spontaneously. Persistent bleeding may come from divided intercostal or internal mammary artery. One or more ligatures passed lightly around the bone may constrict the artery in its groove. This procedure however is more difficult and probably less effective than a wound. With simple hemothorax the problem of the enclosed blood surface. Its removal is advisable. The blood always remains fluid and aspiration is easy.

Blood transfusion is valuable to combat shock and replace lost blood. When massive collapse is present efforts should be made to dislodge the obstructing plug or mucus. Coughing and postural drainage may help. If these fail bronchoscopy is a possible treatment. Spontaneous emphysema is not serious and may be left unless extreme.

Treatment of the injuries themselves depends on the nature and extent of the damage. Adhesive plaster trapping is done for broken ribs. Sucking wounds require an air tight dressing. Such substitutes closed pneumothorax for an open one. Infection is always possible and therefore cleansing should be done as early as possible.

J. D. VAN WILKES, M.D.

Freundlander S. O., and Walpole, S. E. Chronic Inflammatory Lesion of the Lung Simulating Bronchiogenic Carcinoma. *J. Thoracic Surg.* 9:40, 9:330.

Despite continued progress in the experience and ability to diagnose bronchiogenic carcinoma, there are many cases in which an exact diagnosis cannot be made. Also there are several not uncommon conditions which closely simulate the signs and symptoms of this disease.

The authors present 4 cases of chronic inflammatory diseases which so closely simulated the accepted clinical picture of bronchiogenic carcinoma, includ-

ing the onset, course, physical findings, roentgenological appearance, and in 1 case even the biopsy that operation decided and performed. Only elimination of the tissues removed in operation proved their inflammatory character.

The authors believe that surgical intervention is borderline cases, in which bronchiogenic carcinoma is strongly suspected and the clinical and laboratory findings are consistent with the course of that disease, is definitely indicated. Many early tumors cannot be recognized with certainty even with the most advanced methods of diagnosis, and if operation is delayed until the picture is complete in all respects it may be too late to be of any benefit to the patient. The difficulty of recognizing the exact nature of the condition and of differentiating between bronchiogenic carcinoma and chronic inflammatory diseases illustrated by the cases described, is carried over into the operating room. It has been found that even by direct inspection and palpation of the affected tissues it is impossible to differentiate clearly and accurately between the two conditions.

J. E. THORNTON, M.D.

Joly H. Presumably aids with Thoracoplasty (A proposed pneumolysis associates it with thoracoplasty). *Presse Méd. Par.* 949, 45:12.

There are two operations which combine pneumolysis with thoracoplasty, one in which there is more or less extensive resection of the upper ribs with an extrapleural separation of the plane of the lung from the thoracic cage, and another suggested by Carl Semm in which there is an extensive resection of the upper ribs, section of the intercostal vessels near the vertebral column, separation of the suspensory ligaments of the diaphragm, and then extrapleural separation of the mediastinal (medial) surface of the lung from the thoracic contents. According to the Society for the Scientific Study of Tuberculosis (France) good results can be expected only in about 70 per cent of the cases when the first type of operation is performed. The author has performed the second operation, according to the technique of Semm, 31 times between November 1935, and the end of 1936. 20 cases the result as good and in 3 it was unsatisfactory or bad, there were 3 deaths. In other words, good results are obtained in 85 per cent of the cases. This very satisfactory figure is thought to be due to three factors: the use of the Semm technique, its use in a reasonable manner which depends on the clinical and operative findings, and the manner in which the pneumolysis is accomplished, at times very completely and at others in rather restricted manner so as to be regarded as a reasonable risk.

The great danger of the Semm method is infection. This can be largely avoided if certain formal contraindications are accepted: there are any clinical or pathological indication of pleural infection, a previous history of hemilateral, liquid, or fibrous pleurisy, an illary or cervical adenitis, and cold abscess in the thorax. In some cases infection may be

unavoidable on account of the separation of infected lymphatics when the lung is being collapsed. In other cases the risk of infection is known to exist, but the advantage outweighs that risk, that is true in certain cases of non stabilized lesions in which it is most important to have an evenly distributed collapse in order to avoid a much feared focal reaction. In these cases it is important to avoid large pockets caused by the pneumolysis.

It is also wise to limit the pneumolysis when there is operative difficulty, principally in chronic cases in which there are dense adhesions to the trachea, a partial separation of the dome may be useful in such cases, whereas the complete operation may lead to serious consequences.

Recent ulcerations in the parenchyma are the best indication for this operation, and in these, brilliant results are obtained with a minimum of mutilation of the thorax. Children are particularly amenable to this procedure for the same reason and because the dome of the lung can be easily separated. This is one of the principal indications for the operation. The operation is a distinct advance in thoracic surgery, but the limitations of the procedure must be recognized or there is danger that it will fall into disrepute.

ADRIEN VERBRUGHEN, M D

Maier, H C and Haight, C. Large Infected Solitary Pulmonary Cysts Simulating Empyema. *J Thoracic Surg*, 1940, 9 471

Large infected solitary pulmonary cysts of the lung are often erroneously diagnosed as encapsulated empyema before operation, and at times the true condition is not recognized during or after operation. The pre operative differentiation of a large infected pulmonary cyst and empyema is not always possible. Most of the reported epithelized pulmonary cysts have occurred in children or in young adults.

Patients with a pulmonary cyst are likely to have had previous respiratory symptoms and this history may date back to early life. The acute illness usually begins as a respiratory infection. They may or may not have a great deal of purulent sputum. Thoracentesis usually yields pus, but the character and culture of the pus may be similar to that seen in empyema. The roentgenological examination is frequently of great aid in the differentiation of empyema and infected pulmonary cyst but the lesions cannot be distinguished by this means in some cases. The contour of the fluid pocket is often of differential diagnostic value in that the outline of a cyst is spherical or oval in both postero anterior and lateral projections, whereas the outline of an encapsulated empyema may be triangular or fusiform and conforms more to the contour of the thoracic cage or neighboring structures in the region it occupies.

At operation in absence of periosteal reaction on the inner surface of the underlying ribs may be noted in the case of an infected pulmonary cyst. It may be noted also that a portion of the cavity wall has the appearance of a lettuce lung with multiple

bronchial fistulas. If a biopsy of one of the strands shows it to be covered completely by respiratory type of epithelium, the intrapulmonary nature of the lesion is demonstrated. If the true nature of the disease is not recognized at the time of the original drainage and the case is treated as an empyema, a striking feature in the postoperative course is the failure of the cavity to diminish progressively in size despite adequate drainage over a long period of time. The authors go into usual diagnostic factors very completely, then review 3 case histories, and arrive at the conclusion that radical surgery (lobectomy) is necessary in all cases. PAUL MERRELL, M D

Broyles, E N, and Fisher, G E. Bronchoscopic Experiences with Lung Tumors. *Surgery*, 1940, 7 918

From a study of 65 cases of bronchial tumors, the authors find that carcinoma of the lung is much more frequent than generally supposed, that it is four times more common in males than in females, and that it is most common between the ages of forty and forty-five. Carcinoma of the lung is more frequent in the white than it is in the colored race, and there is no causative relationship to occupation. The most common type is squamous cell carcinoma, next is the adenocarcinoma, and next the undifferentiated type. The squamous-cell type usually spreads by contiguity and metastasizes late. The adenocarcinomas tend to metastasize early.

The symptoms and signs of carcinoma of the lung are fever, cough, pain, expectoration, hemoptysis, weight loss, dullness and diminution of breath sounds, and dyspnea. Bronchoscopy and roentgen examination are essential to diagnosis.

Early diagnosis and surgical removal offers the only hope of cure. JULIAN A MOORE, M D

Hauser, H, and Wolpaw, S E. Cavitary Bronchiogenic Carcinoma. *Radiology*, 1940, 34 698

In 15, or 12 per cent, of 127 cases of primary bronchiogenic carcinoma admitted to the Cleveland City Hospital cavity formation was demonstrated with the x-rays.

Cavitary bronchiogenic carcinoma may be confused with tuberculosis and pulmonary abscess and should be differentiated. The clinical history, the physical examination, or the roentgen examination is not sufficiently characteristic to make a conclusive diagnosis.

The history of an insidious onset, a non productive cough later becoming productive with or without foul sputum, and persistent chest pain suggest carcinoma. The physical examination is not helpful. Certain features of the roentgen examination, particularly evidence of bronchial obstruction, is suggestive of malignancy.

Careful examination of the sputum and bronchograms, bronchoscopic examination, and biopsy will usually establish the diagnosis. Probably the bronchoscope is the most valuable means of diagnosis. JULIAN A MOORE, M D

ESOPHAGUS AND MEDIASTINUM

Barnes, E. A Contribution to the Study of Muscular Tumors of the Esophagus (Contributo allo studio dei tumori muscolari dell'esofago) *Arch Ital di mal dell appar digerente*, 940 p 4

Tumors of the esophagus, like neoplasms elsewhere in the gastro-intestinal tract show a marked predilection for the male. The most common site of involvement in the esophagus has proved to be the lower third; the middle third is less commonly involved, and the upper portion is least involved. In the upper third the posterior wall is most frequently attacked, but in the lower thirds the anterior wall is most frequently involved. The leiomyoma is often rounded or ovoid, rarely exceeding the size of hen's egg. Three cases of pedunculated leiomyomas have been reported. For the most part the tumors are well encapsulated and on microscopic examination are found to contain abundant fibrous connective tissue through which bundles of smooth muscle fibers course in all directions. A sclerization is meager and degenerative changes are often present. Malignant degeneration, on the other hand, appears to be extremely rare although Beard has reported one in which the neoplastic character of the lesion was histologically clear.

In the majority of cases clinical symptoms are absent. Dysphagia, hematemesis, weight loss, and obstructive symptoms occur occasionally. The absence of clinical manifestations is believed to be due to the tendency of the esophagus to dilate at the site of the tumor.

The author reports the case of a forty-one year old woman who died of cerebral hemorrhage, in whom was found a leiomyoma about the size of a large almond; it was firm, slightly nodulated, and yellowish white. Histological examination revealed the mass to be deeply embedded in the muscular coat, the overlying epithelium being normal except for flattening of the glands due to pressure. The tumor corresponded closely to those already described, and no indication of malignant degeneration was observed. As in cases elsewhere reported, the pathogenesis remained obscure. Clinical signs and symptoms were absent.

LEON FARRAR ORTE, M.D.

MISCELLANEOUS

Cato, F. L., and Norman, W. B. Traumatic Hemothorax. *Surgery* 940, 7 415

When a chest wound in which hemothorax has developed is seen, a number of questions immediately suggest themselves. Is this case for masterly neglect? Should thoracentesis be performed? If so, when should it be done and how much blood should be aspirated? Is immediate thoracotomy required? What are the comparative results of extreme conservatism, aspiration, and operation?

In an attempt to answer these and other questions, a series of 76 cases presenting definite evi-

dence of hemothorax were analyzed. Only patients whose records showed one or more of the following findings were included in this study: (1) blood obtained by thoracentesis; (2) definite radiological evidence of fluid in the pleural cavity; (3) definite physical findings of fluid; (4) a clinical course compatible with blood in the pleural cavity; (5) hemothorax found at autopsy. In addition, all cases are included in which death from hemorrhage occurred within twenty-four hours after admission.

The authors discuss the symptoms, signs, and temperature curve; these are insufficiently characteristic as a rule, so that the diagnosis of hemothorax is usually simple. Properly interpreted, ray films are also valuable aid. It is important to remember that signs of hemothorax may develop many days following the original injury. Hemothorax is frequently associated with serious visceral injuries, which are the chief cause of the high mortality. Infection of the hemothorax seldom occurs and is not a frequent cause of death in civil cases. Its occurrence is an indication for open drainage.

Immediate operative intervention in selected cases is suggested as a possible means of reducing the high mortality rate in the first twenty-four hours. Repeated or continued bleeding from the chest wound and rapid reaccumulation of the hemothorax indicate that an intercostal or internal mammary artery has been severed. Immediate operation is indicated in such cases. Five deaths from this cause, all deemed as preventable, are reported in this series.

Other indications for immediate operation include open sucking wounds, large lacerations of the lung, and large or heavily contaminated foreign bodies in the thoracic cavity.

Conservative treatment usually yields satisfactory results in patients who survive for twenty-four hours. Routine conservatism, however, is crude and dangerous. Early complete aspiration and controlled positive-pressure air replacement seem to be based on sound physiological principles and deserve a more extensive trial in sterile cases. Total pleural aspiration is indicated for diagnostic purposes, as well as in large hemothoraces and in cases in which pressure symptoms are present.

SAMUEL H. KLEIN, M.D.

Overholt, R. H., and Betts, R. H. A Comparative Report on Infection of Thoracoplasty Flaps. *J Thoracic Surg* 940 p 520.

Sterilization of the operating room air and attempts to control that source of wound infection dates back to the days of Lister, but most emphasis until recently has been directed toward the control of the other factors responsible for wound contamination. In the past few years, however, contamination of clean fields by air-borne bacteria has been given more attention and study and the authors report results obtained in a well controlled and intelligently studied series of more than 700 consecutive thoracoplasties performed over a period of approximately thirty months.

Ultraviolet irradiation and its effect on wound contamination were studied. An ingenious arrangement of two batteries of two 12-in quartz mercury vapor tubes each with suitable reflectors, was installed in the angle between the walls and the ceiling and directed toward the operating table. In studies carried on prior to irradiation during operations, it was found that a rapid reduction of bacteria in the air resulted following irradiation by these burners.

Wound infections were classed as superficial and deep—those involving only the superficial structures of the skin around the sutures, and those involving subcutaneous fat and muscle. Only clean cases were included in this list. Before the use of the ultraviolet irradiation 13.8 per cent of the cases showed some evidence of wound infection. A change in technique with interrupted sutures and the practice of covering the suture line with silver foil reduced the number of infected wounds to 6.53 per cent. This technique, with ultraviolet irradiation in addition, reduced the total number of wound infections to 2.67 per cent (11 of 411 cases), and only 2 of the cases had infections of the deep type and of clinical significance.

It is believed that this study is a valuable indication of the efficacy of ultraviolet irradiation because of the standardized technique employed and the similarity of the cases under treatment.

J. E. TREMAINE, M.D.

Petacchi, M. Primary Sarcoma of the Diaphragm
(Sul sarcoma primitivo del diaframma) *Polisclin*,
Rome, 1940, 47 sez. chir. 136

Primary tumors of the diaphragm are rare. In 1931 Binney found in the literature only 4 cases of primary tumor of the diaphragm. The author discusses briefly the few cases in the more recent literature. He then reports a case he himself studied at the autopsy table, that of a forty-six-year-old man who had died after four months of illness. The chief symptoms had been pain in the right hypochondrium

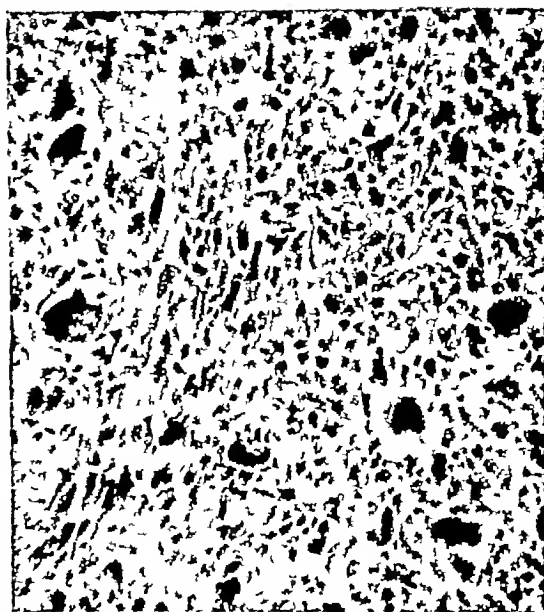


Fig. 1

and anemia. There was never any icterus. The patient was admitted to the hospital in a serious condition with pain and swelling of the abdomen. At the time of death the diagnosis was tumor of the liver. At autopsy the anatomical diagnosis was tumor of the right diaphragm with invasion of the liver, metastasis to the hepatic lymph glands and to the lymph glands of the pulmonary hilus, metastasis to the right lung by way of the blood stream, and neoplastic thrombosis of the portal vein with resultant ascites. The histological diagnosis was polymorphocellular sarcoma (Fig. 1).

JACOB E. KLEIN, M.D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Zavaleta, D. E., and Veppo, A. A.: Taxis of the Strangulated Hernia (La taxis en las hernias estranguladas) *Rev d med. y ciencias afines* 940, 304

Taxis is the manual reduction of a hernial tumor. It was first described and performed by Guilleme de Salicet and even if today it is considered a method of the past, it still has some indications which some times are of extraordinary importance.

The authors do not refer to forceful taxis but to an ensemble of methodical and careful manipulations which tend to reduce the tumor without any danger to the patient. The best indications of this maneuver are very few if one keeps in mind the extreme tightness of many hernial rings, the rapidity of the appearance of the lesions, and the real difficulties found during the operative reduction, even after the ring has been partially severed. However even if the indications are very few the surgeon can be called to perform the operation. Keeping in mind the precepts of Gouelin who in the last years of the past century said that the reduction must be tried by taxis, under chloroformic anesthesia, when one is sure that the intestine has not suffered severe alterations, and in case the taxis is unsuccessful, one must revert without delay to the operation.

The absolute indications for taxis are complete absence of a surgeon or even any doctor who could perform the simplest surgery which is section of the ring through a short incision; patient poor general condition; severe diabetes; cut pulmonary disease; infectious condition; severe cardiac insufficiency; septic process of the skin covering the tumor; pyodermatitis, and erysipelas.

The relative indications refer if the patient is in a very poor surgical medium if he is suffering from chronic pulmonary disease or a mild cardiac insufficiency in case of old age; if good general condition, in controlled diabetes, in a newborn child, or in the insane.

The contraindications refer to strangulation of very prolonged evolution and alarming symptoms; phlegmonous aspect of the hernial tumor which may be suspected of being the result of an inflammatory process even if the condition has not been present for long time. The absence of all of the absolute indications is also a contraindication because taxis of the strangulated hernia is a typical example of an operation which must be performed as soon as possible in the healthy individual as well as in a surgical patient.

It was a rule that taxis be done under general anesthesia but to-day this statement cannot be accepted in every case, because the most important indications are those in which narcotics should be avoided. In some circumstances local or regional

anesthesia may be used. The authors do not advocate spinal anesthesia. They think that a small dose of morphine is useful, and in little children, less reduction cannot be performed because of the effort of weeping, an emema of chloral, or being peaceful sleep and spontaneous reduction, or taxis can be accomplished very easily.

The patient must be laid on his back, in the Trendelenburg position, so that the abdominal capacity is augmented and there is a slight relaxation of the muscles; the lower limbs must be in slight flexion and abduction. After the skin is prepared as usual, the freeing action of the pad soaked in ether may be tried. At times this will be of some use. The handling must be done only a few minutes and with the utmost softness; a tense and prolonged compression must be absolutely proscribed; one must use the fingertips, not the fingertips, push only with the strength given by the hand, and not employ the arm nor the forearm. The contents of the hernia must go back to their original place in the inverse order of their coming out. The maneuver results in the reduction, and can be done at one time or progressively. There is a characteristic sensation of the resistance being overcome, and the finger introduced into the hernial channel, finds it completely empty. Soon after the pain and vomiting disappear.

Sometimes the tumor persists partially; the intestine having been reduced but the great omentum remaining in the sac because of some adhesion. However as the painful tumor has disappeared and there is an improvement of the general symptoms, one can wait with careful and continued examination of the patient.

The accidents associated with taxis are not very rare, even to-day. They may be caused by:

Lesions of the incarcerated organs. This is easily understood, if one remembers that the walls of the intestine are very much weakened by the lack of proper circulation, by the edema, and by the distention. Also the mesentery can be torn and the vessels injured with the production of extensive hematomas.

Introduction of septic material in the abdominal cavity. This can happen when the septic fluid contained in the sac is pushed into the peritoneal cavity through the hernial ring or when they fall into it during the reduction. If an intestinal loop is gangrenous or perforated, it may be reduced without knowledge of this condition and the consequences will be such as can be expected from such condition.

Persistence of the strangulation. A. The false reduction shows the disappearance of the hernial tumor with persistence of the strangulation. This can happen when (1) there is a partial reduction of the incarcerated loops, one of them

being of little volume, not being reached by the exploring finger, (2) there is a so called reduction "en masse," in which the sac and its contents are reduced through the hernial channel without alteration of the respective relations and, consequently, the stricture of the neck of the sac is maintained, (3) at times the hernia is reduced but its contents, instead of going to the abdomen, are introduced into a diverticulum of the sac, (4) the contents of the sac escape through a rent of the wall of the sac, and (5) there is a circular rent of the neck of the sac and the reduction is performed with the neck, which still maintains the stricture.

B An internal strangulation may follow the hernial strangulation when the taxis has been successful but the intestine again becomes strangulated by adhesions.

C The strangulation may persist when its actual occurrence is not in the hernia and the intestinal distention causing the bulging of the hernial tumor is reduced, the strangulation being overlooked.

D The symptoms sometimes persist after a successful taxis when the lesions of the bowel are so severe that the disappearance of the strangulation is followed by a paralytic ileus, which is very stubborn at times.

HECTOR MARINO, M D

Dobson, L The Late Results of the Injection Treatment of Hernia *Surger*, 1940, 7 836

Experimental studies were made to determine the reaction of tissues to various solutions recommended for the injection treatment of hernia. Injections were made into the rectus muscle of dogs in one series and sections were taken at various intervals. In another series injections were made into the abdominal wall above the spermatic funiculus, and the cords and testes were later removed for study. In brief, these experimental studies, as those of other workers, have proved that the injection of certain chemicals produces scar tissue. The reaction of the tissues to solutions of phenol and thuya (25 per cent phenol, 25 per cent specific tincture of thuya, and 50 per cent alcohol), tannic acid, or sodium psyllate was essentially the same for the various solutions.

Following the injection of sclerosing solutions, there was destruction of muscle bundles and the cellular response of a low grade inflammation, with the development of sheets of fibrous tissue interlacing between the remaining muscle bundles. Within two months the fibrous tissue was dense and more adult in type. As time went on, the fibrous tissue contracted markedly, which left small islands of compact fibrous tissue, except for a few bands which extended through the entire muscle belly.

Injections into the spermatic cord produced a partial thrombosis of the veins with compression of the arteries. No changes could be demonstrated in the testes or ductus deferens. Although the processus vaginalis (hernial sac) was compressed, it was not obliterated except in one instance.

Seventy four patients (70 males and 4 females) with 101 hernias were treated by the injection

method. There were 68 indirect inguinal hernias, 21 direct inguinal hernias (including hernias with saddle-bag-type sacs), 10 postoperative inguinal hernias, 1 postoperative femoral hernia, and 1 umbilical hernia.

Based on this experimental and clinical work, the author arrived at the following conclusions:

There are several solutions available which safely and painlessly produce fibrous tissue. The sheets of fibrous tissue produced by the sclerosing solutions after from four to six months contract to form scattered islands of compact fibrous tissue.

The hernial sac is rarely obliterated or even occluded at the neck by the injections. Since muscle fibers are destroyed by the solution, large numbers of injections (over 30) may weaken the abdominal wall in the injected area by replacing muscle with fibrous tissue which eventually stretches. Since the sac is rarely obliterated, the whole basis of cure in the injection treatment of hernia is the fibrous tissue which persists between the fascial planes, muscle layers, and spermatic cord. These adhesions hold the hernial sac compressed and prevent omentum or bowel from entering the neck of the sac.

Follow-up studies on 101 hernias in 74 patients (followed for from six months to two and one-half years after the removal of the truss) showed a recurrence rate of 37.73 per cent in indirect inguinal hernias, 68.42 per cent in direct inguinal hernias, and 100 per cent in postoperative recurrent hernias.

The injection treatment of hernia should be used only in cases of small indirect inguinal hernias in patients with otherwise good abdominal structures who will not or cannot be operated upon.

SAMUEL H. KLEIN, M D

GASTRO-INTESTINAL TRACT

Meyer, H W Perforations of the Gastro-Intestinal Tract *Ann Surg*, 1940, 111 370

Perforations of the gastro-intestinal tract must always be considered as very serious. They must be regarded always as an emergency. The higher (esophagus) or lower (colon) in the gastro intestinal tract the perforation occurs, the more serious the outlook. Even with an early diagnosis the mortality may be high.

In the urgent cases diagnosis is made from the general clinical picture, including a careful history and physical examination. There may be dull aching pain associated with shock which rapidly follows the perforation, the pulse is rapid and thready, the blood pressure low, nausea and vomiting may be present, and tenderness may be diffuse or localized. Abdominal distention is an unfavorable sign.

Perforations of the gastro intestinal tract may be classified as (1) injuries through the abdominal wall caused by bullets or knives, and (2) subcutaneous perforations caused by inflammatory or malignant erosions, by pressure generated within an organ, or by blunt force applied directly or indirectly to the abdominal wall.

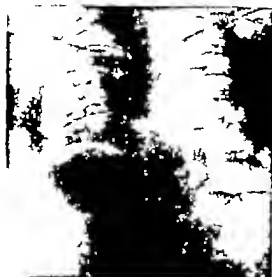


Fig. Roentgenogram of perforation of gastric ulcer showing air and fluid under right diaphragm. (Courtesy of J. B. Lippincott Co.)

The discussion in this article is based on a series of 5 cases of perforation seen at the Lenox Hill Hospital, New York, from 1933 to 1935. In this series the writer excludes perforation of the appendix and of the gall bladder. Esophageal perforations had the highest mortality (87.5 per cent) and colonic perforations presented a mortality of 66.6 per cent which was twice that of gastric and duodenal ulcers. Of the total number of 5 patients, 64 died which gave a mortality of 43 per cent. The perforations occurred as follows: gastric ulcer in 8 cases, duodenal ulcer in 23, perforation of the esophagus in 8, traumatic rupture of the stomach in 1, perforation of the small bowel in 6, carcinoma perforation in 4, perforation of the colon in 6, and perforating diverticulitis in 1 case.

Operative procedure. Fifty-eight of the 8 patients with gastric-ulcer perforations had simple closure of the perforation, the 24 per cent mortality. 4 had simple closure of the ulcer plus appendectomy, the 5 per cent mortality, and 3 had primary closure plus gastro-enterostomy, the 30.7 per cent mortality. Two patients who had primary gastric resection at the time of the perforation survived. 7 patients were drained, with 50 per cent mortality. In 1 case the patient was so ill that operation was contraindicated and both died.

In the duodenal-ulcer cases, practically the same statistics were presented. Sixteen patients had simple closure with 4 deaths, or 5 per cent mortality. 3 had closure of the perforation plus gastro-enterostomy, the 33 per cent mortality. Primary resection performed in 1 case resulted in death on the table. The total average mortality in the cases of duodenal ulcer operated upon was 34.7 per cent.

Butler believes that simple closure should be undertaken by all except the most experienced surgeons and if the elapsed time is more than six hours and a chronic duodenal ulcer is present, with moderate induration and deformity, excision of the ulcer should be performed, the incision being continued through the pyloric ring and the wound sutured transversely. When great deformity and a callosus ulcer are present, with the time of perforation less than six hours, a posterior gastro-enterostomy might well be performed. In gastric perforations only simple closure with possible cauterization or excision of the ulcer margin should be performed regardless of the time of perforation.

It is the consensus of opinion and the writer's experiences agree with this, that simple closure of perforation is the safest procedure. Secondary gastro-enterostomy is rarely required and is much safer as a secondary procedure when indicated. Apparently in early cases drainage is not of much importance, but in late perforations it is definitely indicated.

The author then summarized his article.

The total mortality of all cases operated on or operated upon, as 43 per cent, indicating the seriousness of the condition. The majority of all of the cases were perforations of gastric or duodenal ulcers with an operative mortality of approximately 3 per cent. These perforations of gastric or duodenal ulcers may occur without any previous ulcer symptoms. This happens more frequently in the gastric than in the duodenal type of ulcer.

The time element between perforation of the ulcer and operation is most important as regards the mortality. Perforations of duodenal ulcers are not as serious as those of gastric ulcers. In the cases with recovery the time element was approximately three times longer in the duodenal than in the gastric series. Primary, simple closure appears to give the best results with the lowest mortality. Secondary gastro-enterostomy after simple closure is rarely necessary. If pyloric stenosis is to occur it usually develops within one year of the primary closure.

Recurrent ulcer symptoms may be associated with hemorrhage. Recurrent ulcers may be of gastric, duodenal, marginal, or stomal type if gastro-enterostomy has been previously performed. In these cases gastric resection is occasionally required. The most frequent cause of operative mortality is peritonitis with secondary pneumonia.

Esophageal perforations, while infrequent, are attended with high mortality. Early operations with extensive drainage are required to save the patients' lives.

Perforations of the small bowel result from a wide variety of causative factors. Trauma is the most important. The surgical procedure should be as simple as possible.

Colon perforations, as well as those of the sigmoid and rectum, are followed by high mortality because of the high degree of infectiousness of the colonic contents with resultant peritonitis.

The most common type are those of perforation of the sigmoid diverticula and the mortality for these is high

JOHN W. NUZUM, M.D.

Fulchiero, R. The Value of Gastric Chromoscopy with Neutral Red (Il valore che si deve attribuire alla cromoscopia gastrica col rosso neutro) *Arch Ital d mal dell'appar digerente*, 1940, 9 117

Glaessner and Wittgenstein in 1923 were the first to use gastric chromoscopy with neutral red clinically. They injected 5 c cm. of a 1 per cent solution intramuscularly and then studied the gastric secretions. In 40 cases they found that the neutral red appeared within from ten to fifteen minutes in the case of normal acidity, within from five to eight minutes in hyperacidity, and within from twenty to sixty minutes in hypo acidity. The author reviews the literature on the subject since then and notes that the views of various authors differ markedly.

The author studied the procedure on 78 patients. He used 20 patients without digestive disturbances as controls and injected the neutral red intramuscularly and in another group of 20 without digestive troubles he injected the dye intravenously. The remainder were patients with appendicitis, duodenal ulcer, carcinoma, and cholecystitis. The excretion of the dye was correlated with the study of the gastric acidity.

On the basis of these studies he concludes:

Neutral red in a dose of 5 cgm. is harmless when injected intravenously or intramuscularly and causes no general reaction.

The excretion of neutral red by the gastric mucosa is independent of the secretion of the digestive juices.

The maximum intensity of excretion of the dye does not correspond with the maximum excretion of the gastric acidity.

There is no correlation between the quantity of gastric juice secreted and the rapidity of appearance of the color.

The procedure did not enable the differentiation between true and false gastric achylia, and he finally concluded that it had no diagnostic value and should by no means displace gastric analysis.

JACOB E. KLEIN, M.D.

Doub, H. P. The Differential Diagnosis of Pyloric and Prepyloric Ulceration. *Am J Roentgenol*, 1940, 43 826

The improvement in roentgenological technique has made it increasingly easier to demonstrate ulcerative lesions in the prepyloric and pyloric areas, but the differential diagnosis of these lesions has not been improved. These areas are important because they are the site for the majority of all gastric carcinomas, benign gastric tumors, and gastric syphilis. They are also the favorite location for benign gastric ulcers, spastic phenomena, and hypertrophic pyloric stenosis.

Roentgenological examination alone cannot always lead to accurate differentiation between benign and malignant ulceration here. The final diagnosis

must of necessity rest upon a careful study of serial sections of the resected lesions. Improvement effected by medical-ulcer therapy may persist for some months even in a malignancy.

This work follows the recent trend in that the author limits his study to lesions of the pyloric ring and the prepyloric area within 1 in. of the pylorus. The report of Holmes and Hampton from the Massachusetts General Hospital, Boston, in which malignant prepyloric ulcerations were found twelve times more frequently than benign ulcerations is again contrasted to that of Singleton from the Toronto General Hospital, Toronto, Canada, of a series of 7 cases which were all benign gastric ulcers.

The author's report comprises 35 cases. The final diagnosis, determined histologically, showed benign peptic ulcer in the cases of 24 patients, carcinoma of the antrum in 7, chronic gastritis in 3, and syphilis in 1. It was impossible to reach a definite diagnosis on roentgenological findings in the doubtful cases, although the presence of a slightly overhanging border which, upon pressure, presents a ridge displacing the barium and leaving a clear zone around the ulcerated area, is of some help.

The conclusions were that chronic ulcers occurring in the pyloric and prepyloric areas have a greater tendency toward malignancy than similar ulcers in the body of the stomach. A differential diagnosis between carcinoma and ulcer presents great difficulties. A satisfactory response to medical therapy should not eliminate a suspicion of malignancy, and an early diagnosis is most important if these lesions are to be operated upon early enough to permit resection. Although there may be some objection to resection because of the operative mortality, only 1 postoperative death, approximately 3 per cent, occurred in this series, which is far less than the mortality would have been if resection had not been performed early in the cases of carcinoma in this group.

SAMUEL J. FOGELSON, M.D.

Emile-Weil, P., Brocq, P., and Eudel, F. Polyps of the Gastric Mucosa in Pernicious Anemia, a Case of Gastrectomy Followed by Cure (A propos des polypes de la muqueuse gastrique dans la maladie de Biermer. Un cas de gastrectomie suivie de guérison) *Mém Acad de chir*, Par., 1940, 66 376

Emile-Weil and his associates report a case of pernicious anemia in which mucous polyps developed at the pyloric antrum. As this gastric lesion is not widely recognized as occurring in pernicious anemia, atrophic gastritis being considered characteristic, the presence of the polyps may lead to errors in diagnosis. In the case reported the diagnosis was further obscured by the fact that the blood count as reported at the time of the first examination was not typical of pernicious anemia. The correctness of this report is doubtful.

The patient was a man of fifty-three years of age, who gave a history of attacks of diarrhea alternating with periods of constipation. Recently he had had

a few attacks of vomiting, and on one occasion had noted blood in the stools. He had lost much weight. These symptoms in a man of his age suggested cancer of the gastro-intestinal tract. Examination with the rectosigmoidoscope was negative. Roentgenological examination with the opaque meal showed definite defect in the prepyloric region and the antrum. The fluoroscope showed this region to be rigid and immobile. These findings were constant on repeated examinations. The blood count, as reported, showed a definite anemia—red cells, 3,503,000; myelocytes, 5 per cent and metamyelocytes, 3 per cent. The report as given did not definitely indicate pernicious anemia. On the basis of the clinical and roentgenological findings, operation was indicated. At operation there was no enlargement of the glands but several tumors were found on palpation in the region of the antrum, and gastrectomy was done. After operation the patient developed a high temperature and showed an normal pallor without any evidence of infection in the operative field or hemorrhage. A second blood count showed only 50,000 red cells with a color index of .6, anisocytosis, and deformed red cells. The diagnosis of pernicious anemia was confirmed by third blood count and sternal puncture. Two blood transfusions were given combined with the injection of liver extract and vitamin treatment. After the second transfusion the patient showed marked improvement. Additional transfusions were given combined with the administration of extract of gastric mucosa; the patient made good recovery and has been kept in good health and able to work by continuing the anti-anemic therapy.

Examination of the section of stomach removed showed hypertrophy of the pylorus resembling that found in infants. The gastric mucosa showed marked hypertrophy except for a localized hypertrophy in the pyloric antrum, where there was marked epithelial proliferation and polypoid formation. There was no evidence of malignancy.

In this case the diagnosis of gastric carcinoma, as based on the symptoms, the presence of chlorhydria and the roentgenological findings. The presence of pernicious anemia was not recognized until after the operation. Achlorhydria and atrophy of the gastric mucosa have been recognized as typical of pernicious anemia for many years. However the presence of polypoid formations in the stomach has not been frequently noted, at least in France. Some investigators in the United States and Germany, however, have reported a number of cases in which gastric polyps are associated with pernicious anemia. The correct diagnosis of gastric polyps is difficult even with modern methods of roentgenological examination; gastroscopy is of definite aid, but even the gastroscopic picture may not definitely show the presence of polyps. The gastroscopic examination is of greater aid when considered in relation to the roentgenological findings.

It should be recognized that gastric polyps may develop in the course of pernicious anemia in fact

they may be regarded as resulting from the inflammation of the gastric mucosa which is so constant a feature of this type of anemia. While modern treatment with gastric and liver extracts may bring about complete remission of the anemia, the polyps persist. Such polyps may undergo malignant degeneration, and this may explain the origin of certain gastric cancers that have been observed in cases of pernicious anemia. This does not imply that every patient with pernicious anemia and associated gastric polyps should be submitted to gastrectomy. The case reported shows, however, that if gastrectomy is indicated in such cases it can be done with safety provided intensive anti-anemic treatment with liver and gastric extracts is given.

ALICE M. MITCHELL

Hilghusen, S. E. An Analysis of Five Years Hospital Records of Gastric and Duodenal Ulcers. *South African J. M. Sc.* 940, 3, 30

This study was undertaken to establish certain fundamental facts on "peptic ulcer" in the European population of South Africa where the climate is subtropical. It was stimulated by the knowledge that the South African native has a very low incidence of ulcer occurrence.

The material consisted of 245 cases in which it was found that the idiosyncrasy, and age incidence of peptic ulcer in the European in South Africa were very similar to those factors in Europe and America.

SANTER, J. FOOTLOCK, M. D.

Zanetti, L. Hypoglycemic Manifestations in Gastric Surgery (*Le manifestazioni ipoglicemiche nella chirurgia gastrica*). *Arch. ital. di med. del. 1940* 940, 9

Among the postoperative disturbances manifested by patients with ulcer, a syndrome characterized by fatigue, anxiety, tremors, vertigo, palpitation, vasomotor irregularities, and occasionally nausea, somnolence and fall of arterial blood pressure is worthy of note. These symptoms appear shortly after meals and simulate in all respects the familiar picture of hypoglycemia, and investigations showed that the individuals so affected gave a typical glucose tolerance curve marked by low slices after from one to two hours. A possible association with gastric hyperacidity was also noted.

Zanetti controlled his experiments with a series of patients who had undergone laparotomies for conditions other than peptic ulcer in order to rule out non-specific surgical complication. In this series no abnormalities of glucose metabolism were observed. A second group of patients were then studied, patients in whom ulcers were present but who had not undergone surgical intervention. Of this group, patients who did show high gastric acidity, such appeared concomitantly with an episode of hypoglycemia, one and one-half hours after a meal rich in carbohydrates.

The first experimental group consisted of 5 patients upon whom gastric resection had been done

Twenty-one of these reacted normally to the ingestion of dextrose, 8 complained of nausea, headache, perspiration, and hunger, it was necessary to abandon the test of the remaining 2 patients because of the severity of the symptoms. In the 10 individuals manifesting hypoglycemia after from one to two hours the blood sugar values varied from 58 to 69 mgm per cent, and were preceded by peaks at the half-hour period. The symptoms were of short duration.

Seven patients upon whom gastro enterostomy had been performed comprised the next group. Of these, 2 had protracted periods of moderate hypoglycemia.

Three patients in whom the pylorus and duodenum had been removed showed no noteworthy abnormalities of the carbohydrate metabolism.

On the basis of these experiments the author advances the opinion that since the absorption of carbohydrates is more active in the jejunum than in the duodenum or the ileum, it is probable that the arrival of large quantities through the anastomotic opening to that portion of the intestine causes the absorption of unduly large quantities of glucose. The abrupt hyperglycemia then elicits an extraordinary output of insulin which later brings about the observed hypoglycemia. EDITH FARNSWORTH, M D

Lahey, F H. The Diagnosis and Treatment of Gastrojejunal Ulcer and Gastrojejunocolic Fistula. *Surg Clin North Am*, 1940, 20 767

In any patient who has had a duodenal ulcer, the symptoms of which have been relieved by gastroenterostomy, the recurrence of active ulcer symptoms should make one conscious of the fact that such symptoms are in all probability due to gastrojejunal ulcer. There are certain types of individuals in whom there seems greater likelihood of the occurrence of a gastrojejunal ulcer following the employment of gastro-enterostomy for peptic ulcer than in others. The younger the individual and the higher the acids, the more likely is the possibility of gastrojejunal ulcer.

There are certain types of operative procedure which are known to predispose to the formation of gastrojejunal ulcer, particularly von Liselsberg's exclusion of the pylorus.

In addition, it has been said that the lower the segment of jejunum which is anastomosed to the stomach the less well equipped is that segment to receive acid gastric contents. For that reason posterior gastro enterostomies with their short jejunal loop probably have a slightly lower incidence of gastrojejunal ulcer than operations involving the antecolic loops, in which lower levels of the jejunum are attached to the interior wall of the stomach, as these levels are less well equipped to withstand the effects of direct dumping of gastric acid contents onto their mucosa.

In the past years another factor has been thought to influence the formation of gastrojejunal ulcer the employment of non absorbable suture material.

It was the author's opinion that when a gastrojejunal ulcer occurs in the presence of a non-absorbable suture, the suture can well be described as an innocent bystander.

The dangers of gastrojejunal ulcer are intraperitoneal perforation, hemorrhage, and perforation into the transverse colon.

The x-ray diagnosis of gastrojejunal ulcer is evidenced by stenosis of the opening, the appearance of a fleck of barium, rapid emptying of the stoma, or by rigidity of the stoma.

While it has been stated in the past that gastrojejunal ulcers are not amenable to medical treatment, that has not been the author's experience and it is his opinion that these cases should all be given a trial of medical treatment first.

The surgical treatment of gastrojejunal ulcer should be radical. The author's experiences with conservative surgical measures for this condition, such as pyloroplasty, secondary gastro enterostomy, or restoration of the alimentary stream to its normal position, have been unsatisfactory. The operation of choice for gastrojejunal ulcer is high subtotal gastrectomy, together with removal of that portion of the jejunum containing the ulcer. The end-results with this operative procedure have been satisfactory. If gastric resections are to be high, they cannot be done with clamps. The author has been able to do non soiling, high resections in subtotal gastrectomies largely because of the de Petz sewing machine. The other factor which has to do with success in subtotal gastrectomy for peptic ulcer in general is that, after the jejunum has been anastomosed to the stomach, no jejunojejunostomy is done. For a number of years the author employed the Polya anastomosis, by means of which the jejunum is anastomosed to the entire cut end of the stomach. Now for a number of years this has been entirely abandoned for the Hofmeister type of anastomosis, in which the upper half of the stomach is closed, the jejunum is anastomosed side to end to the lower open half of the stomach, and the remaining jejunum is buttressed as a reinforcement over the closed upper half of the stomach.

JOSEPH K. NARAT, M D

Bercovitz, Z. Recent Advances in the Treatment of Chronic Ulcerative Colitis. *Med Clin North Am*, 1940, 24 683

Experiments carried out by the author over the past four years indicate that the presence of cellular exudates in the bowel discharge points to pathological change in the bowel wall, whereas the absence of cellular exudates may mean that the bowel condition is not associated with anatomical change. To study cellular exudates, a smear of bowel discharge is made with Loeffler's methylene blue and protected with a coverslip. Examination under oil immersion reveals two well defined types of cells: polymorphonuclear leucocytes and epithelial cells. A report of the presence of endamoeba histolytica in diarrheal discharges should not be accepted as final until or

unless typical forms of the ameba have been found. If there is any suspicion that cysts of protozoa may be present, Lugol's solution should be used to bring out the nuclear structure.

Because lymphogranuloma venereum so frequently enters into the differential diagnosis of chronic ulcerative colitis, the author routinely tests 11 patients with Frei's test. It is also emphasized that diarrhea is frequently the result of constipation or even a narrowing of the bowel lumen. Therefore digital and sigmoidoscopic examinations are of vital importance as diagnostic procedures.

It has recently been recognized that vitamin deficiencies are often associated with chronic ulcerative colitis. Deficiency frequently lies not in the quantity of essential vitamins ingested, but in the amount absorbed and utilized by the body. Eighty to 90 per cent of the author's series of 33 patients with chronic ulcerative colitis showed evidence of Vitamin-C deficiency. Seventeen of 30 patients followed up were relieved of symptoms or moderately benefited after taking 500 mgm. of ascorbic acid daily for several weeks. The oral ascorbic-acid requirement in patients with chronic ulcerative colitis apparently is increased roughly in proportion to the number of stools and the amount lost in the stools. From 2,000 to 6,000 mgm. of ascorbic acid are often necessary to "saturate" such patients, depending upon the degree of deficiency, the mode of administration, and other factors influencing the requirements. After this initial dose, it was found that oral maintenance requirements ranged from 50 to 100 mgm. given in divided doses daily.

Because many patients with chronic ulcerative colitis have low hydrochloric-acid values in the gastric juices, it is often helpful to prescribe hydrochloric acid and pepsin. Although Vitamin B and liver extract given by injection have caused improvement in some patients, it is not known whether this has been due to maintenance of the general condition, or direct treatment of deficiency factor.

The use of histidine hydrochloride has been of questionable value in the treatment of chronic ulcerative colitis. It was thought that if the drug had a beneficial effect on the gastric mucosa, it should have a similar effect on the mucosa of the bowel. Although no changes in the bowel mucosa have been demonstrated, histidine has proved beneficial in a fairly high percentage of cases observed in the past three years. The general impression of this method of treatment is that the results are sufficiently encouraging to warrant continuing it.

Whereas formerly blood transfusion was resorted to as a final measure of desperation, today it is regarded as one of the chief methods of approach to the treatment of this disease, and it is emphasized that transfusion should be given early and in adequate amounts. Neopentoniol has been of little value in the treatment of the author's patients, but the doses used were not large.

Careful attention must be given to foci of infection, particularly in the urinary tract.

Patients with chronic ulcerative colitis should have a high protein and low residue diet, well balanced in vitamins and with enough starches added to maintain caloric requirements. The value of any new method of treatment of chronic ulcerative colitis depends upon the success with which the following requirements are met: (1) a large number of cases in which the diagnosis has been properly confirmed must be followed up (2) a sufficiently long period of time before, during, and after treatment must be allowed for observation in order to rule out spontaneous or seasonal remissions (the author suggests that this period be from three to five years) and (3) another group of patients treated by other methods, should be carefully observed for comparison over the same period of time.

HAROLD LATTIN, M.D.

Cherry L. B. Appendiculae: Appendiceal Obstruction Stimulating Acute Appendicitis. *Surgery* 94: 7, 900.

Many patients who are thought to have acute appendicitis are found at operation to have an apparently normal appendix and no pathological explanation for the clinical symptoms which they manifest.

The author reviewed 100 clear-cut cases which were diagnosed pre-operatively as acute, subacute, or subacute appendicitis, or as an acute or subacute flare-up of chronic appendicitis, in which the appendix exhibited no gross or microscopic evidence of acute inflammation. In 88 per cent of these patients there was definite obstruction to the lumen of the appendix by feces, fecaliths, kinking, or electrical constriction. In contrast obstruction was found in 9 per cent of 30 cases of chronically inflamed or incidentally removed appendices and in 2 per cent of 325 consecutive autopsy specimens.

The term "appendiculae," derived from the Latin *claudere* meaning to bar or to close, is suggested for definite disease entity in which there is obstruction of the appendix without any evidence of active inflammation. It is almost impossible to differentiate the clinical picture of appendiculae from that of acute appendicitis and for this reason the logical treatment is appendectomy. The diagnosis of appendiculae is usually made at operation.

The clinical and laboratory findings in the 88 cases of proved appendiculae were compared with those in 100 cases of proved simple acute appendicitis. There are very few differentiating features. The 30 incidence for obstruction is slightly higher than that for acute appendicitis, and appendiculae are more common in females than in males. A history of previous attacks as more often obtained from patients with obstruction. Cramps or colic occurred in only 36 per cent of the patients with appendiculae and pain as generally less severe than in patients with appendicitis. Patients with appendiculae are more likely to have pain localized in the right lower quadrant from the start, although, even among them, the majority had ep

experience in the treatment of acute cholecystitis. He advocates early and emergency operations.

Cholecystectomy which the author considers the operation of choice in acute cholecystitis, is recommended because of its simplicity. Infiltrative edema of the peritoneum makes dissection of the gall bladder extremely easy as the latter can be very simply separated from the hepatic bed and the omental adhesions by blunt dissection. On the other hand, once the inflammation has subsided, the operator very often finds firm adhesions which unite the gall bladder to the duodenum, the transverse colon, and the great omentum; only part of the gall bladder may then be removed with the accompanying danger of perforation of the organs which form the subhepatic block.

The postoperative condition of patients who have undergone early operation is better than that of patients upon whom a late operation has been performed; there are fewer complications and the period of hospitalization is shorter. The operative mortality is more or less the same for the two procedures.

It is impossible to ascertain, from the clinical aspect of a case, the extent of the lesions of the gall bladder. A patient with a necrotic process in danger of perforation has the same symptoms as a patient with less important lesions. The author found necrotic lesions in 50 per cent of his cases, and examination of these cases did not reveal any symptoms which gave definite indication as to the severity of the condition present.

Either anesthesia was used in one half of the cases and, in the other half, spinal anesthesia with 6 mgm. of percalone.

The operative procedure used is antegrade cholecystectomy which is very much facilitated by puncture and aspiration of some of the contents of the gall bladder. In order to facilitate section and ligation of the cystic duct the author calls attention to the fact that in acute cholecystitis, the proximal portion of the gall bladder is found enlarged and distended and rests directly upon the common duct. Edema sites both organs in such a manner that one has the impression that the serosa of the small omentum is united with that of the gall bladder and that there is an enormous cystic duct. The author advises separation of the gall bladder from the common duct by blunt dissection with the tips of the scissors, so that the cystic duct is well freed. In case this procedure is difficult and dangerous, he advocates section of the gall bladder, a piece of it being allowed to remain.

The piece of edematous gall bladder which remains in the ligature is the cause of biliary discharge occurring the first few days following the operation, because once the infiltration disappears, the ligature becomes loose and the cystic duct allows the passage of some bile. Only twice has the author encountered hemorrhage from the cystic artery during the operation. However this eventuality could be very easily taken care of by compression of the hepatic pedicle between the index finger and thumb of the left hand, as it stops the hemorrhage very quickly. Drainage obtained by the use of one wick of gauze and one rubber tube of medium size made for better postoperative course than when larger drains were employed.

Hector Mayo, M.D.

GYNECOLOGY

UTERUS

Teahan, R W, and Wamrock, H The Results of Treatment in Carcinoma of the Uterine Cervix *Am J Obst & Gynec*, 1940, 39 995

From February 1, 1928, to December 1, 1934, 136 patients with carcinoma of the cervix were seen by the authors. Of these, 122 were treated and 26 have remained well for at least five years, an absolute-cure rate of 19.1 per cent and a relative-cure rate of 21.3 per cent. With one exception, these patients were treated exclusively by radiological methods.

The best results were obtained by combined x-ray and radium treatment. The interval between the appearance of the first sign and the patient's first visit to a physician averages five and one-half months. The interval between the first visit to a physician and the first pelvic examination averages two months. The interval between the first pelvic examination and the institution of cancer treatment averages three and one-half months.

There is an average delay of eleven months between the appearance of the first sign and the initiation of cancer treatment. While the patient is consulting a physician more promptly after the appearance of the initial sign, there does not appear to be any shortening of the interval between the first visit and the first pelvic examination. A large number of the patients were treated for cancer before admission and were given more treatment because the disease had not been controlled. In 69 patients the treatment was initiated by the authors and 22 of these lived five years or more, a cure rate of 33.3 per cent. EDWARD L CORNELL, M D

ADNEXAL AND PERIUTERINE CONDITIONS

Feldmann, E A Clinical and Etiological Study of Torsion of the Pedicle in Ovarian Tumors (Beitrag zur Klinik und Aetologie der Stieldrehung bei Ovarialtumoren) Basel Dissertation, 1939

After a short clinical description of ovarian tumor with torsion of the pedicle, the author presents a detailed critical review of the various theories on torsion of the pedicle. During the period from 1920 to 1938, there were recorded among the total of 19,614 patients visiting the Woman's Hospital at Basel, 570 cases of ovarian tumor, and of these 59 presented torsion of the pedicle, an incidence of 10.35 per cent. Any torsion of the originally flat extended pedicle on its axis exceeding 180 degrees is regarded as torsion, whether nutritional disturbances are present or not. The condition occurred more frequently on the right than on the left side, the ratio being about 53.4 to 46.6. As regards age distribution, the incidence of torsion of the pedicle in the period between ten and twenty years was 10 per cent, between twenty-one and thirty years, 21 per

cent, between thirty-one and forty years, 26 per cent, between forty-one and fifty years, 26 per cent, between fifty-one and sixty years, 12 per cent, and between sixty-one and sixty-five years, 5 per cent. The size of the individual tumors in this series of cases was given as the size of a fist in 28 per cent, the size of a child's head in 38 per cent, and larger than a child's head in 10 per cent, in 20 per cent the size was not given.

The clinical picture and differential diagnosis were not unusual. Immediate operation was performed in nearly 11 cases, the abdomen being entered through a Pfannenstiel incision. Symptoms of infarction appeared in 60 per cent of the tumors. In 20 per cent of the cases dense, heavy adhesions to the mesocolon, anterior abdominal wall, and omentum were noted. Only one of the 59 patients with torsion of the pedicle died, three days after the operation, from acute cardiac insufficiency.

In the second part of his article, the author concludes that it is impossible to demonstrate a single factor responsible for the phenomenon of torsion of the pedicle of ovarian tumor, as the number of factors involved is too great. In almost every case, a combination of several internal predisposing conditions and other factors were found, the relative significance of which varied in almost every case. Possibly experimental investigation will serve to determine the relative part played by each factor and its significance to the twisted pedicle more accurately than has been possible at this time from a purely statistical evaluation of the material available.

(PUETZ) EDITH SCHANCHE MOORE

Bittmann, O Krukenberg Tumors (Ueber die Krukenberg-Tumoren) *Arch f klin Chir*, 1940, 198 103

Four cases of Krukenberg tumors are described in which secondary tumors were found in the pancreas, the hypophysis, or the cecum. The author believes that the Krukenberg tumors are not always metastases, but frequently represent primary tumors. They merit especial interest from the standpoint of tumor multiplicity. Both tumors, in these cases, grew slowly and supposedly regulated each other in their growth. The second tumor usually manifested itself when the first tumor was removed.

In animal experiments the survival period of white mice after the implantation of Ehrlich's adenocarcinoma was determined. Survival was lengthened if the tumor was implanted in two places. Thus, it was determined that after a certain time one of the two tumors grows rapidly and the other tumor regresses. Furthermore, a primary tumor exercises a restraining influence on a second tumor of the same type which is implanted later. From these animal experiments, the author considers the Krukenberg tumors also as multiple primary and simultaneously com-

penetrating tumors. Their relative rarity and their occurrence at younger ages than other ovarian carcinomas speak for their primary nature. To clear up this relationship, the author recommends that the surgeon always inspect the ovary in cases of gastro-intestinal tumors.

(ENTENEN Y.) RONALD R. GRIFFIN, M.D.

MISCELLANEOUS

Winkelstein, L. B. The Effect of Thyroid on Sterility in Normal and Hypothyroid Females. *Am J Obst. & Gynec.* 94, 40-41.

Sixteen sterile women, free of all pathological and infectious processes, were given desiccated thyroid extract in tablets or doses regardless of the thyroid status of the individual. Nine of the entire group became pregnant, 7 remained sterile. Of the 9 in whom pregnancy occurred, only 7 carried the fetuses to viability, aborting as the result of external trauma.

Five of those who became pregnant are suffering from true clinical hypothyroidism; the remaining 4 had unmistakable evidence of subclinical hypothyroidism. No evidence of thyroid dysfunction could be elicited in the group of patients who remained sterile. Therefore, the effect of thyroid, as an adjunct or curative measure for sterility, was only demonstrable when definite lack of thyroid was present. Likewise, when no deficiency in thyroid metabolism existed, the addition of this drug was of no apparent value.

Thyroid has a definite and valuable place in the treatment of female sterility only if hypothyroidism is present. It is of little or no value when normal thyroid function is present.

EDWARD L. CORNELL, M.D.

Du Is, M. E. A Clinical Study of Stilbestrol. *Am J Obst. & Gynec.* 94, 39-43.

Stilbestrol, a new synthetic estrogen unrelated to the natural estrogens, has tremendous clinical possibilities. The oral administration of the drug can reproduce all the changes induced by the natural estrogens in much more effectively and to a greater degree. It replaces the estrogenic action of the ovary. Many clinical conditions which are the result of deficient ovarian activity or its complete cessation can now be treated easily and successfully. The treatment of disturbances of the menopause and of primary menorrhagia with stilbestrol is discussed in this paper.

The widespread clinical use of stilbestrol must wait more adequate evidence as to its possible toxicity. Pharmacological experiments involving the long-continued administration of moderate amounts of this drug must be carried out to determine its undesirable effects. Careful clinical observations must be continued with the most guarded approach until such time as the lack of toxicity of the drug can be firmly established.

EDWARD L. CORNELL, M.D.

Huberman, J., and Colmer M. J. The Effects of Di Ethyl Stilbene (Stilbestrol) on Menopausal Symptoms. *Am J Obst. & Gynec.* 94, 37-41.

Seventy-seven menopausal patients were treated with a synthetic estrogen, stilbestrol. Amounts necessary for complete replacement in the menopause varied from 0.1 mgm. to 5 mgm., with an average of 4 mgm., which were given hypodermically three times a week for six weeks. Some improvement was noted in 90 per cent of the cases, 6 per cent of them exhibited improvement with regard to the majority of all the symptoms.

In general, the results were more or less comparable to those of natural estrogen, viz., relief of the menopausal syndrome, conversion of the menopausal into the estrous type of vaginal smear and restoration of the normal appearance of a previously atrophic vulva or vagina.

Like natural estrogen, stilbestrol acts on the fallopian tubes, and influences peristalsis. Treatment should continue until results appear and should be resumed if relapses occur.

In no instance was the drug produced vaginal bleeding. Patients should be warned about the possibility of pseudomenstrual bleeding; this treatment is stopped, and reassured as to its meaning.

The drug is active whether given hypodermically, by vaginal suppository or by mouth. The average suppository dose is 0.1 mgm., inserted twice a day; the average mouth dose is 4 mgm., tablet each evening; and the average hypodermic dose is 4 mgm. three times a week. EDWARD L. CORNELL, M.D.

Fallas, R., and Rosenblum, G. Endometriosis. *Am J Obst. & Gynec.* 94, 38-44.

The authors conclude:

Adenomyoma becomes surgical at later gestation. Does pelvic endometriosis then may be due to slower development of the symptoms in the uterine site.

The high incidence of fibromyomas and endometrial hyperplasia in the series of 200 cases reviewed would seem to add eight to previously suggested common etiological factors: these conditions and endometriosis.

Some disturbance of menstruation is the most commonly found symptom. This takes the form of dysmenorrhea or some type of uterine hemorrhage. Retroposition of the uterus is present in more than half of the cases in which the position was noted. In external endometriosis the relief of symptoms was decidedly better accomplished by ablation of ovaria than by conservative surgery.

A much larger percentage of pre-operative diagnoses is possible if attention is given to more accurate history and if surgeons become endometrial-minded as the incidence of the condition deserves.

Extensive endometriosis involving trunks which render excision extremely hazardous should be treated by removal of all ovarian tissue even in the younger age groups.

EDWARD L. CORNELL, M.D.

GYNECOLOGY

Custo, E. L. The Production of Experimental Fibromas by Means of Injections of Follicular Hormone (Produzione di fibroma sperimentali per mezzo di iniezioni di ormone follicolare) *Clin ostet*, 1940, 42 201

Custo used for his experiments 34 female guinea pigs divided into various groups consisting of castrated and non castrated animals, some of which were laparotomized in order to introduce a piece of silk thread into one of the uterine horns, and some of which were not operated upon. Some animals of each group served as controls or were treated only with injections of sterilized oil, while all the remaining ones were given each week an injection of dihydrofolliculin corresponding either to 1 mgm or to 5 mgm of the hormone. The treatments lasted from four to eight months. After an initial period of well being, some of the animals, especially the castrated ones, showed signs of suffering, such as loss of appetite, weight, and hair, for which no cause could be detected, those who died belonged principally to the group that received the highest dose of folliculin. The results of the experiments showed that it is possible to cause the formation of tumors in various parts of the body of the animals by means of weekly injections of follicular hormone, the tumors were found in the castrated as well as in the non castrated animals, and the presence of a piece of silk thread in one of the uterine horns did not seem to have any decisive importance for the occurrence of tumor, since about the same formations were found

in 6 animals carrying a silk thread and in 5 who had not been laparotomized. As this is only a preliminary report, the nature and the histological peculiarities of the tumors cannot yet be given exactly, but it can be stated that the tumors are similar to those described by the French authors who established their fibromatous character.

The tumors were found to show a predilection for the uterus, either in one of the horns or in the body in the vicinity of the bifurcation. They varied in size, form, and consistency, but in general did not reach the size of a small nut. Numerous tumors were also found in the region of the mesenteric lymph nodes, they were small, hard, round, or oval, and were of pinkish-white color. At times, a small tumor was found adhering to the intestinal wall, usually the colon. Another site of predilection was the greater curvature of the gastric wall. Finally, some tumors were observed in the liver and the spleen. In the latter organs, they appeared as small, rounded, whitish zones, which were clearly distinguishable against the reddish-brown tissue of the organ. No tumor formations were ever observed in the kidneys, the suprarenal glands, or the remaining organs or tissues. As far as can be stated at present, the tumors do not show any characteristics of malignancy. The very high doses of follicular hormone used and the prolonged duration of the treatment cannot be compared even to the highest therapeutic doses administered in some morbid manifestations in gynecological practice. RICHARD KEMEL, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Woodhouse K. W.: Tubal Pregnancy. A Study of Cases with Emphasis on Diagnosis and on Blood Loss in Relation to Shock Symptoms. (Am J Surg 94: 49 3)

The incidence of tubal pregnancy at the Guthrie Clinic and Robert Packer Hospital between June 3, 1917 and April 30, 1938 was 1.53, which is not an accurate proportion between extra uterine and intra-uterine gestations in this community.

The idea that preexisting tubal infection is an important cause of tubal pregnancy is borne out in this series. In 65.8 per cent of the cases definite history or findings of pelvic inflammation were obtained. No data can be offered in support of or in disproof of endometrial tubal implants as a causative basis for tubal implantation.

There is no evidence in the literature or in these cases that race is a predisposing factor of any importance. Tubal pregnancy may occur at any time during the child-bearing age. The decade of greatest incidence is between the ages of twenty-five and thirty-five years, including 51 per cent of the cases in this series.

The average marital period in these cases was 9.74 years, which confirmed the idea that tubal pregnancy most frequently occurs following an extended period of marriage. Of the patients in this series, 78.6 per cent had been pregnant previously an average of 2.8 times, 4 per cent were nulliparae. In more than half of the 34 cases in which the interval following the preceding pregnancy was noted, the patients had a secondary sterility of more than three years' duration.

Tubal pregnancy recurs more frequently in patients with previous ectopic gestation than in the general group of child-bearing women. Recurrence in this series was 4 per cent, which is in agreement with the majority of figures presented in the literature.

After careful classification of the cases in this series, the number of tubal abortions and of rupture as found to be the same, 3 cases of each. The least frequent finding of operation as an unruptured tubal gestation (5 per cent in this series). No appreciable difference was noted as to the tubes involved in 38 cases the right and in 35 cases the left tube was involved.

The diagnosis of tubal pregnancy is difficult and frequently missed. There was a diagnostic error in 3.8 per cent of these 73 cases.

Pain is the most constant symptom of tubal pregnancy. It was present in all but one case in this series. The type and character of the pain is roughly an index to the existing pathology. Referred pain does not occur or is very infrequent in unruptured cases.

Amenorrhea was present in 50.7 per cent of this series, varying in only days duration. The average period of amenorrhea was longer in cases of tubal rupture than in cases of tubal abortion by ten days.

Abnormal external bleeding occurred in 21.4 per cent of these cases, beginning on an average of 3.5 days before operation and continuing as a more or less interrupted flow of small amount in the majority of cases.

Subjective symptoms of pregnancy were infrequent. Nausea and vomiting occurred in 23 of 73 cases but usually followed pain of some severity. Symptoms and signs of syncope and shock were almost limited to cases in which tubal abortion or rupture was the finding. The average blood pressure readings were lowest in cases of tubal rupture and essentially normal in unruptured cases. The converse was true in respect to the pulse rate.

Temperature readings vary considerably and depend on whether the patient is in severe shock or has had recent hemorrhage. The temperature tends to rise moderately immediately following an intraperitoneal hemorrhage. This rise is usually not more than 0.5 degrees.

Abdominal tenderness is an almost constant finding in tubal pregnancy, specified as absent in only unruptured cases and in case of tubal abortion in this series. Tenderness is most frequently general across the lower abdomen in cases with intraperitoneal hemorrhage, and localized to the quadant involved in unruptured cases.

Rigidity was an infrequent finding in this series present in only 9 cases of tubal abortion and rupture. Distention of some degree as found in 30 per cent of the cases reviewed.

Cullen sign is rarely seen. It was noted in 7 per cent in this group.

Pelvic tenderness on bimanual examination was specified as absent in only one case. The tenderness was most marked throughout the pelvis in most cases of rupture and some of tubal abortion, whereas it was usually localized to the side involved in unruptured tubal pregnancy.

A mass as palpated in 63 per cent of the cases in which the pelvic examination as described, least often in cases of tubal rupture. Forty-one per cent of this series showed softening of the cervix, enlargement of the uterus, or both.

The laboratory studies and principally in the determination of leucocytes, the erythrocytic count and hemoglobin. The Friedman test as positive in the 6 cases in which it was made in this series. Dilatation and curettage were used as diagnostic procedure in cases in this series to advantage. There is little real contraindication to their use.

No doubt there are occasional cases of ectopic pregnancy in which hemorrhage alone will not explain the shock manifested clinically and in these

cases a neurogenic or vasogenic explanation of the shock picture is necessary, however, in this study there were no patients exhibiting marked or severe shock who did not have evidence of marked or severe intraperitoneal hemorrhage

In this series of 73 cases, the mortality was 1.37 per cent, which compares favorably with other series reported in the literature

J THORNWELL WITHERSPOON, M D

Albers, H Blood Volume and Water Balance in Pregnancy and the Puerperium (Blutmenge- und Wasserbewegungen in der Schwangerschaft und unter der Geburt) *Zentralbl f Gynaek*, 1939, p 1377

The total plasma volume and total erythrocyte volume of healthy, mature, well developed women weighing from 48 to 63 kgm were determined by the dye method. For an average weight of 55 kgm the average plasma volume was 2.25 liters, 4 per cent of the body weight, and the blood volume was 3.5 liters, 6.3 per cent of the body weight. These figures correspond to those usually given in the literature. This relationship changes during pregnancy. In pregnant women with an average weight of 58 kgm, the plasma volume was 3 liters or 5.2 per cent of the body weight and the blood volume was 4.5 liters or 7.7 per cent of the body weight. The increase in blood volume during pregnancy is, therefore, principally an increase in plasma volume.

Determinations of the blood and plasma volume in the same women before and after delivery showed that the blood volume after delivery is, on the average, 800 cc less. Seven hundred cubic centimeters of this decrease is a decrease in plasma, therefore, a concentration of the corpuscular elements occurs. The total erythrocyte volume increases from 32 per cent before delivery to 37 per cent after delivery. Bleeding after delivery, therefore, has a different import from bleeding during pregnancy. Before delivery there is a plasma plethora which causes an increase in the blood volume of about one liter. Blood loss during pregnancy is more readily tolerated since fewer erythrocytes are lost, but after delivery the plethora no longer exists and bleeding represents a greater loss of erythrocytes. During the two weeks of bed rest the blood again becomes thinner. The total erythrocyte volume decreases accordingly. On this basis any intervention which causes a loss of blood should be delayed until the second day after delivery. In edema of pregnancy, other relationships occur than in normal pregnancy. The blood volume is only 5.3 per cent, and the plasma volume is 3.3 per cent of the body weight. Simultaneous observations were made on the blood volume, blood composition, and diuresis. In a normal pregnancy the increase in plasma volume is so greatly out of balance that, in spite of increase in the number of erythrocytes, a picture of oligocytic hypervolemia results, while in edema of pregnancy there is fluid retention in the tissue, and the blood becomes thickened so that an increase in erythrocytes is

apparent. The oligocytic hypervolemia of normal pregnancy is changed into a relative polycythemic hypovolemia.

(NOTHDURFT) RONALD R GREENE, M D

Crabtree, E G, and Reid, D E Pregnancy Pyelonephritis in Relation to Renal Damage and Hypertension *Am J Obst & Gynec*, 1940, 40 17

In a survey of 45 patients with pyelonephritis associated with pregnancy, evidence was produced by means of intravenous pyelography, intravenous phenolsulfonphthalein excretion, concentration of the urine test, and tests for retention of nitrogen which indicated that a high percentage of these patients suffer appreciable damage to their kidneys, which is demonstrable at from five to ten years after the infection. In the majority, adequate renal function is present at that time.

In the patient in whom there has been both toxemic and pyelonephritic injury, the prognosis is grave. Hypertension was found to be present in all the patients in whom there had been both toxemia and pyelonephritis (3 cases). Two of the 3 were dead at five years after the injury. Six patients with pyelonephritis showed blood-pressure readings above 150/90, associated with some evidence of renal deficiency at that stage of the natural history of the disease. Renal injury, as demonstrated in this group, consisted of injury to the conduction channels, pelvis and ureter, and to the cortex. When there is injury to the conducting channels, the stasis of urine produced by this condition may further injure the cortex, especially when infection is still present. Stone occurred in 5 of the 45 patients studied. Evidence of total renal deficiency was present at the time of examination in some proved unilateral cases. This finding suggested some other injury than bacterial invasion for the second kidney. The pyelonephritis of pregnancy should be looked upon as a progressive disease in many cases. Data have not yet been produced to indicate to what extent it shortens life. Some of the cases which were subnormal may have shown only the original damage and may now be in a stationary state. Sufficient evidence has been produced to indicate that the aim in treatment in pyelonephritis associated with pregnancy should be to minimize the initial injury and clear the infection as soon as possible.

EDWARD L CORNELL, M D

Tenney, B, Jr, and Parker, F, Jr The Placenta in Toxemia of Pregnancy *Am J Obst & Gynec*, 1940, 39 1000

A study of toxemia of pregnancy has been made with the purpose of correlating the placental pathology with the clinical and laboratory findings. Also a titration of the prolactin of pregnancy in both the placentas and urines has been done. Sixty of the cases in this review have been studied by the medical service as well as the obstetrical.

From the results obtained, it is believed that the placental lesion (syncytial degeneration of more than

50 per cent of the small (terminal villi) is an accurate indicator of the severity of the toxemia. The placental lesion is found in cases with no previous hypertension or kidney damage. It is present in many cases with previous renovascular disease. Therefore, toxemia is an entity in itself which may either appear with an undamaged kidney or may be superimposed upon previous kidney damage. It is present in many cases with previous renovascular disease. Albuminuria is the most accurate sign of the presence of placental damage.

A titration of the protein of pregnancy, both of the placenta and of the urine, shows no standard difference between normal and toxemic cases. The medical classification of hypertension in pregnancy agrees largely with the placental findings, except in some cases with previous hypertension in which there was a very early placental lesion with no marked clinical signs of toxemia. EDWARD L. CORWELL, M.D.

Modall, A. L., Nayar, A. R. M. and Menon, M. K. K. Eclampsia: A Clinical and Biochemical Study. *J. Obst. & Gynec. Brit. Emp.* 940, 47, 49.

The report of Modall, Nayar and Menon is based upon a study of 148 cases of eclampsia in the Government Hospital for Women and Children at Madras, India. Their studies extended over the 6-year period of 1936 and 1937 during which time there were 8,504 confinements. Seasonal and variable weather conditions were found to bear no relation to the incidence of the eclampsia.

The greatest incidence occurred between the ages of fifteen and eighteen years. 93 of the patients were primiparas. Twelve cases were post-partum, 87 were ante-partum, and 57 were intra-partum. Sixty-two cases occurred at term, 24 at thirty-six weeks, 4 at thirty-four weeks, 6 at thirty weeks, 3 at twenty-eight weeks, and 1 at twenty-four weeks. Four patients had had eclampsia previously.

Edema, headache, vomiting, visual disturbances, disorientation, epigastric pain, tachycardia, and mental disturbances were the symptoms noted. In 98 per cent of the patients the blood pressure had returned to normal by the end of the first week. Only the values for systolic pressure are given. In 4 patients, the appearance of albumen in the urine was not observed until forty-eight hours after the development of convulsions. Elevation of temperature was noted in 63 per cent of the patients, and the pulse rate was more than 100 in 53 per cent. In this 53 per cent the condition was of greater severity than in the patients with slower pulse rates. Convulsions ranged in number from 1 to 73, the greatest number occurring ante-partum. Death occurred in 3 cases, mortality of 8.78 per cent.

Upon analyzing the various symptoms and signs relation to the mortality rate, the authors concluded that cases presenting the combination of little or no albumen, no edema, moderate hypertension in late pregnancy and the onset of eclampsia early in pregnancy manifest the condition in its most severe form. Two patients remained undelivered, 1 death.

In all others, delivery was made from below. Among the total of 44 ante-partum and intra-partum cases, there were 36 stillbirths and 1 neonatal death. No mention is made of the fetal mortality in the post-partum group. Treatment was conservative in this series of cases, but for the past 10 years the authors have employed puncture of the membranes, with reduction in mortality from 16.7 to 8.75 per cent. In 3 patients eclampsia developed in the thirty-fourth week, the condition as classified as "mild" and all of the patients recovered. The pregnancies were allowed to proceed to term at which time normal, healthy infants were delivered. A fourth patient suffered a recurrence of symptoms and labor was induced by puncture of the membranes.

Clinically these cases are classified into renal, hepatic, and mixed types. The criteria for each type are set forth.

CHRISTIE C. DOMESTY, M.D.

J. Wirt, C. T. Hyperthyroidism and Pregnancy. *Am. J. Obst. & Gynec.* 940, 30, 934.

There were 3 cases of hyperthyroidism in 3,430 pregnant women, an incidence of only 0.076 per cent, which is a low figure in a seacoast city as compared with higher incidences in cities in the goiter district. With proper treatment, patients suffering from hyperthyroidism may safely go through pregnancy and sometimes even be benefited thereby. Hospitalization for evaluation and stabilization may be necessary several times during the ante-partum period. Iodine therapy is without danger even over long periods of time both during and after pregnancy. There is some question regarding the ill effects of iodine in adenomatous goiter, but its use in diffuse goiter is generally accepted. Therapeutic abortion is rarely indicated, although it was performed in 1 per cent of the cases, most of which were those of private patients.

Thyroidectomy was not performed during pregnancy. The optimum time for this operation is believed to be in the first post-partum year in the cases in which it is indicated, so that the effects of pregnancy on the gland are no longer present. However, thyroidectomy may be performed regardless of the pregnancy in the individual case as shown by reports in the literature. The high incidence of toxemia of pregnancy (76 per cent) in the present study seems to be of significance, and raises the question of a common factor in toxemia and thyrotoxicosis. The increase in the basal metabolic rate in normal pregnancy may be due entirely to thyroid hyperplasia concomitant with the pregnancy rather than to the active protoplasmic mass of the fetus. In the 3 cases, the rate was virtually the same in the second and third trimesters of pregnancy and immediately post partum when the products of conception had been delivered. Normally the basal metabolic rate returns to non-pregnant levels.

A probable basal metabolic rate curve for normal pregnancy based on the current knowledge of the test, is presented. Pregnancy may have an ameliorating effect on the hyperthyroidism. Only one

was thought to have been aggravated by the gestation. Nitrous oxide, oxygen, and ether anesthesia were used for delivery, which was usually spontaneous and of short duration as most of the patients were multiparas. Local anesthesia is preferred.

EDWARD L. CORNELL, M.D.

LABOR AND ITS COMPLICATIONS

Malzev, G. High Puncture of the Membranes. A Review of 842 Inductions of Labor with the Drew-Smythe Catheter. *J Obst & Gynaec Brit Emp*, 1940, 47: 237.

The author reviews his experiences with high puncture of the membranes as a method of inducing labor. The belief that this method is almost identical with artificial rupture of the membranes is fallacious. The two methods have this much in common: they both induce labor by contractions initiated by the passage of an instrument through the cervix and by the sudden reduction in size of the uterus. In the case of artificial rupture, this reduction is effected by the loss of the bag of forewaters and the subsequent escape of the liquor amni, while the whole object of high puncture is to limit the loss of liquor amni and to preserve the forewaters intact. This will, no matter what the indication, enable labor to take its normal course and avoid the risk of dry labor and ascending infection of the uterus. The only contraindications to high puncture are ante partum hemorrhage and vaginal sepsis. For ordinary artificial rupture a high presenting part is a definite contraindication because of the danger of prolapse of the cord.

The technique is described in detail. The efficiency of the method was found to be enhanced by the preliminary use of Watson's castor-oil quinine pituitrin method the day before the puncture. Anesthetics and sedatives are not advised. After thorough vaginal preparation the cervix is exposed with a Sims' speculum. Dilatation is unnecessary. The Drew-Smythe catheter (a special S shaped catheter), with stylet withdrawn, is passed up the cervical canal behind the head, between the uterine wall and the membranes. When the point of the catheter has passed above the child's head, the stylet is pushed home and the proximal end depressed by so doing the distal end ruptures the membranes. The evellets of the catheter are now in the amniotic cavity, and liquor amni commences to flow. From half to one pint is drawn off. After the withdrawal of the catheter there is practically no further escape of liquor. If liquor amni does not flow after the attempt to puncture the membranes the catheter should be guided round to the opposite side and a fresh site punctured.

Labor was induced in 842 cases by this method. Disproportion was by far the most frequent indication (400 cases). Toxicemia accounted for 184 cases. The majority of the patients went into labor within four days; about 40 per cent were in labor in less than twenty-four hours. The length of the latent period

was in no way related to the amount of fluid withdrawn. In 125 cases a second puncture was necessary. The rather long latent period and the occasional necessity for repeating the puncture (in 14.8 per cent) are not considered as drawbacks because the eventual results were so excellent. Labor failed to ensue in only 14 cases.

The average duration of labor was sixteen and three-tenths hours for primiparas and eight and four-tenths hours for multiparas. Nearly 90 per cent of the deliveries were spontaneous. Cesarean section was performed in 5 cases, being induced for disproportion in each case, 1 of the patients in the last group died.

The pyrexia rate was 3.4 per cent and the sepsis rate 1.3 per cent. One patient suffering from uterine sepsis died, but in the remaining 10 the infection was confined to the uterus and readily responded to treatment.

There were 7 maternal deaths, a gross mortality rate of 0.83 per cent, but 6 were due to severe toxemia or chronic nephritis and were in no way connected with the induction. In the seventh case the induction may have been responsible for the fatal issue by the possible introduction of sepsis.

There were 846 viable infants, including 8 sets of twins. The gross fetal mortality was 80 deaths (9.4 per cent). If one excludes the deaths due to accidents during delivery and acquired infant diseases, a corrected fetal mortality rate of 20 deaths (2.4 per cent) is obtained, but even all of these cannot be attributed to the method of induction. So far as mortality was based on the final correction of the fetal rate of 1.3 per cent.

Prolapse of the umbilical cord occurred on 4 occasions, an incidence of 0.48 per cent, with 3 stillbirths. In all, the prolapse occurred late in labor. There were 490 inductions (58.2 per cent) for disproportion in this series. The author is enthusiastic and believes that the results of the treatment of disproportion by high puncture of the membranes, as distinct from all other surgical methods of induction, including artificial rupture, are comparable with the best obtained after trial labor and have the additional advantage of a lower incidence of major operative interference. DANIEL G. MORTON, M.D.

Kinloch-McCollum, J. A Case of Subcutaneous Emphysema Complicating Labor, with a Discussion as to Theories of Causation. *J Obst & Gynaec Brit Emp*, 1940, 47: 309.

The occurrence of air in the subcutaneous tissues is an unusual and interesting complication of labor. The first case was reported by Simons in 1783. Since then many cases have been reported, including a case which the author reports. The total number in the literature is now 151. There appears to be one common feature in all of the cases, namely, the bearing down efforts of the patient, even though in many cases delivery has been relatively easy. Dystocia is common in such cases.

A long, dry labor, rigid soft parts, malposition of the vertex, and slowly dilating cervi are commonly reported. While usually observed during the second stage of labor the emphysema may occur in the first stage, but frequently it is not noticed until the delivery has been completed. If we hold that all gases access the cellular tissues through a solution of continuity of the respiratory tract, and no other hypothesis is possible, the break may occur at any point where there is a lesion, or even in normal tissue when other factors are adequate.

Great exertion at delivery seems to be the only cause. It must be presumed that its origination is promoted by congenital anomalies in the respiratory ducts or boomerang habit of rupture of the pulmonary tissues.

Diagnosis does not offer any difficulty. Swelling which at first may be mistaken for edema has the characteristic crackling of air crepitation. Redness, cyanosis, or pallor is not often present, but if it does appear first in the neck or face, spreading to the chest and back, then to the arms, and less frequently to the abdomen and entire body the patient presents a typical and often grotesque appearance. There is more or less discomfort or pain in the affected areas, sometimes the patient has felt something burst or tear in the neck. Dysphagia, hoarseness, and aphonia have been observed, cough and dyspnea are common, and occasionally the patient's cardiac and respiratory distress is alarming. The swelling usually disappears spontaneously within seven to ten days.

As a general rule treatment should be expectant, the delivery being terminated when there is rapidly spreading emphysema, or when there is definite evidence of cardiac or respiratory distress. The condition has a direct harmful effect on the fetus. It is better to deal with the condition in most cases as one of obstetrical shock, and to treat the patient with great gentleness, rather than to perform immediate extraction. D. W. G. Moxon, M.D.

MISCELLANEOUS

Jeffcott, T. N. A. *Mixed Abortion and Mixed Labor*. Lancet, 1929, 113: 945.

The author presents a series of 55 consecutive cases of mixed abortion and mixed labor treated by the medicinal method, finding them all as successful as 48 of the 55 cases reported. The object of this method of induction is to increase the sensitivity of the uterine musculature by the administration of estrogens. The present technique consists of the intramuscular injection of 1 mgm of estradiol benzoate every eight hours for seven or eight days. On the fifth day if abortion or labor has not occurred, 5 gr of quinine hydrochloride is given each hour until 3 doses have been given. This is followed by 4 injections of 3 cc of extract from the posterior lobe of the pituitary gland at hourly intervals. If this routine fails to produce evacuation of the uterine contents, it is repeated on the eighth day of the estrogenic administration. Stilbestrol may be used

in place of estradiol benzoate. 1 mgm are given orally three times daily or 1 mgm every four hours for seven or eight days. In addition if necessary quinine and pituitary extract are given as above.

The given rationale of the therapy depends upon building up the amount of estrogen in the blood following death of the placenta. The uterus then released from the all powerful influence of progesterone and can react to estrogens by expelling the dead products of conception. Emptying of the uterus was free from complications such as atonic hemorrhage and infection.

WILLARD G. F. ENCK, M.D.

Repetti, M. *Resistance of the Cesarean Scar in Relation to Its Site (Sulla resistenza della cicatrice cesarean in rapporto alla sua sede)*. *Folia Gynaecol.* 1929, 37: 59.

Repetti states that rupture of the uterus has become relatively rare because the pathological conditions which lead to it are now avoided by cesarean section. However this preventive treatment has given rise to a new variety of rupture caused by dehiscence of the cesarean scar according to recent statistics, this rupture occurs during subsequent labors in from 1 to 3 per cent of the cases who have been submitted to the operation. Repetti describes a case of spontaneous rupture of the uterus which occurred during the beginning of labor in a woman who had undergone two cesarean sections, one of the lower segment and one of the fundus. The rupture corresponded exactly to the line of the scar of the fundus on which the placenta was inserted. This case presented ideal conditions for the comparison of the resistance of the cesarean scar during labor in these two locations.

There is no doubt that the technique used in cesarean section has considerable influence in determining the accident, but it is not easy to obtain good healing of the wound even with accurate suture during the normal involution of the uterus, the muscle shrinks and after a few days the edges of the wound are at least partly separated and the entire process of healing is disturbed. As this takes place during the favorable postoperative course conditions are even worse if infection arises, because secondary healing will result in the formation of connective tissue scars which will be less resistant than muscle. In addition, implantation of the placenta over the scar (and this occurs rather frequently) increases greatly the possibilities of uterine rupture. Rupture of the vessels in premature detachment of the placenta will cause the formation of a retroplacental hematoma which may exert a destructive infiltrating action on the muscular wall of the uterus. A number of predisposing causes have been cited to explain rupture in such a technical error in suture or the insertion of the placenta on the scar could be incriminated, and a nervous element has lately been injected into the discussion. Finally the chances of rupture are increased by the shortening of the interval between cesarean section and the

subsequent pregnancy. On the other hand, cases have been reported in which an imperfect scar has resisted successfully the assault of very prolonged labor and version, and also cases of rupture at a distance from the scar in which anatomical study has revealed perfect formation without connective tissue and with regeneration of the muscular fibers.

Lately, some authors have disagreed on the advantages of lower cesarean section and have expressed doubts concerning the solidity of the scar in this region, which is the usual site of uterine rupture in cases that have not been operated upon previously. However, statistics show that rupture of the scar of the fundus is much more frequent than that of the lower segment, and this becomes especially apparent in subjects who have undergone cesarean section on both the fundus and the lower segment. In the present case, the rupture occurred quite suddenly when the pains had just started. The surface of the rupture gave the impression of a wound that had been sutured recently and had been reopened after three or four days. The aspect and the thickness of the uterine wall at the site of the laceration were normal and the scar of the lower segment showed no changes and could hardly be recognized. The placenta covered the fundus scar nearly completely, and it is logical to think that its insertion and its villous infiltration of the site were one of the principal causes of the dehiscence of the scar, which was incapable of resisting the effect of the first contractions of the uterus. No other element seemed to justify the difference in the behavior of the two scars as both operations had been followed by a normal course of healing.

The prognosis after cesarean section must consequently be reserved and the patient must be kept

under observation during subsequent pregnancies. The shock which accompanies rupture in these cases is extremely grave, and immediate intervention is indicated to save the life of the patient.

RICHARD KEMEL, M.D.

Stroink, J. A. The Treatment of Patients with Hydatidiform Mole (Wie behandelen wir unsere Patientinnen mit Molenschwangerschaft?) *Nederl. Tijdschr. v. Geneesk.*, 1939, p. 2608.

The author reports 35 cases of hydatid mole and 12 cases of chorio epithelioma which were observed between 1927 and 1938. After referring to the value of the Aschheim-Zondek reaction in diagnosis and the importance of the roentgen rays in therapy, he exhaustively considers the diagnosis and therapy of (1) the hydatid, and (2) the chorio-epithelioma. He comes to the conclusion that conservative treatment of hydatid moles does not increase the danger of chorio epithelioma. All 28 women who were treated for hydatid moles recovered. With adequate control of the patient after abortion of the mole, a chorio epithelioma can be recognized very early with the help of the Aschheim-Zondek test, and only in these cases can it be cured by roentgen therapy. In an advanced stage, combined operation and irradiation is indicated. The prognosis for chorio-epithelioma following a hydatid mole is, in this way, greatly improved. Metastases to the lung, vagina, and bowel can be caused to disappear by irradiation. In cases of chorio epithelioma after abortion or parturition the chances are not so good as in such cases the diagnosis is usually made too late and then the presence of widespread metastases makes successful therapy impossible.

(H. BRÜHLER) RONALD R. GREGG, M.D.

GENITO-URINARY SURGERY

ADRENAL, KIDNEY AND URETER

Porta, G. Complications in the Urinary System after Rectal Surgery (Le complicanze dell'apparato urinario negli interventi sul retto). *Arch. ital. di urol.* 940, 7 5

The author presents an introductory discussion of the embryology of the cloaca, the urogenital septum, and the formation of the rectum, anus, and surrounding muscles. He reviews the anatomy including the circulation and lymphatics, the latter being very important in the spread of infection. He then discusses the innervation and notes how often rectal irritation may cause symptoms in the bladder or other part of the urogenital apparatus since these areas have ramal from the spinal nerves in common.

He describes briefly the usual anorectal operations, particularly the incisions, dilatation of the sphincter, cauterization, removal of foreign bodies, and plastic operations for congenital defects as well as resections and amputations for cancer.

There are various urogenital complications associated with this type of surgery. The bladder is most commonly affected, then the prostate, ureter and kidneys. There is acute bladder retention

which may occur immediately after anorectal surgery or several days later. The most common cause of this is trauma to the anorectal nerve terminations which leads to reflex spasm of the vesical sphincter. This fact is demonstrated on the attempt to use rubber catheter to overcome the obstruction. Researches of Hill, Malcolm, and Roger have demonstrated that in from 30 to 50 per cent of these cases the retention is fortunately transitory in nature. Another complication is hyperemia of the bladder and perirectal and perivesical tissues as result of vasomotor disturbances from reflex changes in the sympathetic system. This may be so severe as to cause hematuria or may go on to full-blown cystitis. The latter is caused by the bacillus coli migrating in from the intestinal tract. With retention or congestion the cystitis tends to persist. It may be generalized or localized to the trigone.

Whipple has reported that in 200 surgically treated cases of rectal carcinoma the incidence of more or less grave cystitis is 50 per cent.

Next to the bladder the prostate is most commonly involved by complications after anorectal surgery. There may be simple congestion, invasion by the bacillus coli, acute nodule, diffuse non-suppurative prostatitis, or acute suppurative disseminated miliary prostatitis. The latter is associated with fever and urinary retention. Or, prostatic abscess may form there with severe pain and tenesmus, and tendency toward spontaneous rupture. The author reports briefly clinical cases of prostatic abscess which developed several days after ordinary hemorrhoidectomy.

The ureter may become inflamed and ureteritis may develop. This is rarely reported. Such, however, this may lead to pyelitis and pyelonephritis, which are usually due to the bacillus coli. The author reports a case of Razzaboni in a thirty-eight-year-old female who developed a pyelitis on the left side ten days after a radical Whitehead operation for hemorrhoids. Suppuration may develop in the renal parenchyma itself and may cause the so-called malignant carbuncle of the kidney with all the symptoms of abscess formation. The perirenal tissues are important in the spread of such infections.

A very rare complication is oliguria with eventual uremia. This may depend on a reflex inhibition of renal function. Finally pelvic phlebitis and thrombophlebitis even with embolus, may occur. This involves particularly the perivesical plexus of the veins.

The author then concludes by discussing briefly the treatment of the conditions described. Retention of the bladder is treated by catheterization. Cystitis and pyelitis are treated with urinary antiseptics such as urotropin and mandelic acid. Sometimes renal pelvic lavage may be necessary. Abscess formation is treated according to the surgical principles of drainage. The general condition of the patient must be supported by such measures as hypodermoclysis to combat the toxemia.

JACOB E. KIRBY, M.D.

Austen G., J. Pelvic Lavage with Sulfanilamide in the Treatment of Renal Infections. *J. Urol.* 940, 43 637

Sulfanilamide, when given by oral or subcutaneous routes, is excreted by the kidney in concentrations which are effective against most of the organisms causing upper urinary tract infections. The drug is excreted in both its free and conjugated forms. The higher the concentration of sulfanilamide in the urine the more marked is its bacteriostatic and bactericidal action. The concentration of the drug in the urine depends upon the amount administered, the urinary output, and the state of renal function. Satisfactory administration is not always possible because of untoward reactions such as anemia, leucopenia, and skin rash.

Because of the direct action of sulfanilamide on the organism causing the infection, the author believed that direct instillation of the drug into the renal pelvis would be of value especially when the drug was not tolerated by the usual routes, when renal function was reduced, when there was interference with drainage, and when an anatomical or pathological abnormality prevented high local concentration.

A soluble compound of sulfanilamide, promethine maltonide (P. S. 386) was used in these cases. The drug

Arezzi, G, and Marini, A Partial Nephrectomy
(Sulla nefrectomia parziale) Arch ital di urol,
1940, 17 93

ANDREW McNALLY, M D

The purpose of the present series of experiments carried out on dogs and rabbits was to determine whether there is danger of urinary fistula after partial resection, to evolve a hemostatic technique, to study the efficacy of the electric knife for the operation, to decide how much kidney tissue could be removed with impunity, and to decide whether the operated region acts as a locus minoris resistentiae which invites infection in the presence of an artificially induced bacteremia.

The authors review in detail the literature on techniques suggested in the past for the treatment of

The authors tried the various techniques on 20 rabbits and 18 dogs. Functional tests were done before and after operation and histological studies were carried out on the kidneys after operation. The effect of the electric knife was studied. The several rabbits colon bacilli were injected into the veins before operation in order to ascertain whether the organism tended to localize in the kidney after operation. Detailed protocols are presented of all the experiments with illustrations, photographs, and microphotographs to clarify the text. The authors conclude that the text is not present and that part of the text is not present.

The authors conclude that partial nephrectomy does not present any particular dangers as far as primary or secondary hemorrhage is concerned, provided that a suitable technique is used. There

Pick, J W, and Anson, B J. Retrocaval Ureter. Report of a Case with a Discussion of Its Clinical Significance. *J Urol*, 1940, 43 672

Diagram illustrating the postcaval system in a case of postcaval transposition. The diagram shows the abdominal aorta and its branches, including the superior mesenteric artery (A. mes. sup.), renal arteries (Ren.), and lumbar arteries (V. lumb. III, V. lumb. II). It also depicts the inferior vena cava (Vc I) and its branches, including the renal veins (A. v. ren.), the common iliac vein (A. v. lumb. III), and the common iliac artery (A. v. lumb. II). The diagram is labeled with various anatomical structures and their relationships.

Fig 1 Postcaval ureter and related structures (authors' case) male negro, forty four years old Three fifths natural size The aorta has been pulled aside to expose the lumbar arteries, the common stem (left) for the suprarenal and spermatic arteries has been drawn downward from its original position upon the renal artery Abbreviations gl. supr., glandula suprarenalis, a. supr. acc., a. suprarenalis accessoria, a. v. ren., a. and v. renalis, v. lumb., a. lumbalis, a. v. sperm. int., a. and v. spermatica interna, a. v. il. comm., a. and v. ilaca. communis, a. mes. sup., a. mesenterica superior, a. coel., a. coelica, v. c. i., v. cava inferior * indicates communication with first lumbar vein

man, and the clinical aspects of the condition, are presented. A diagrammatic illustration of post caval ureter and related structures accompanies the article.

D. E. M. and M. D.

Grieco, F. Two New Methods of Uretero-Intestinal Anastomosis (Due nuovi metodi di anastomosi uretero-enteriche). *Arch. Ital. di Med.* 940, 7, 93.

Grieco has made a number of experiments on dogs and rabbits with the new methods of uretero-intestinal anastomosis. The first method consisted of transplantation of the ureter into the appendix and the second associated with the uretero-intestinal anastomosis a simultaneous temporary or permanent derivation of the urine through the skin.

In the first method, three silk sutures are passed through the lumen of the ureteral stump from the lumen toward the outside. The serosa and muscular layers of the appendix were cut and dissociated enough to allow the introduction of the ureteral stump and a silk suture was passed through the mucosa and tied. By means of straight needle one of the ends of this suture, as passed through the appendicular lumen and the wall of the colon as high up as possible, and the ureteral stump was fixed to the treated appendiculus some with the three sutures. The appendix was invaginated few centimeters and the invagination sutured to the ureteral stump. This was repeated twice then the silk suture leaving from the wall of the colon was pulled out, which cut the mucosa of the appendix.

In the second method, the intestinal loop was treated according to the method of Coffey. A probe was passed into the stump of the ureter and suture inserted through its wall at some distance from its extremity, this fixed the ureter to the prepared zone of the intestine. The ureter as bared by suture of the intestinal muscular layer and of the serosa over it and the distal extremity of the ureter was sutured to the skin. With the use of this method, the cutaneous derivation of the urine lasted until necrosis of the ureteral wall and of the intestinal mucosa had established the necessary communication.

Unilateral anastomosis of the ureter to the appendix by the method of invagination and consequent elimination of the appendix has given good results inasmuch as the anastomosis has been shown to function. All the danger of infection of the peritoneal cavity was avoided and the contralateral kidney did not show any signs of suffering. The intervention may find its indications in cases in which there is no absolute necessity for complete exclusion of the bladder as in injury to the right ureter and in testicular tumor involving the right ureter. Bilateral uretero-appendicular anastomosis has failed in every one of the author's experiments.

Unilateral or bilateral anastomosis of the ureter to the intestine, whether the small intestine, the colon, the sigmoid, or the rectum, has given good results when associated with simultaneous temporary cutaneous fistula of the distal extremity of the

proximal stump of the ureter. It has allowed nearly all of the experimental animals to live without incurring the usual complications, such as urinary infection, uremia, peritonitis, intestinal obstruction, ureteral obstruction, and urinary and fecal fistulas, which aggravate the prognosis of the various methods proposed or adopted by other authors up to the present time. This intervention allows exclusion of the urinary bladder during the same operation. In addition, the cutaneous derivation can be kept up until the danger of urinary stasis, reflex anemia, or ureteral stenosis, which is associated with the immediate postoperative period has passed. It also allows closure of the cutaneous fistula by means of a simple, superficial, and absolutely innocuous repair operation at the opportune moment when the laboratory tests for renal function indicate it. This method has given good results even when the anastomosis has been performed in close vicinity to the kidney, this suggests that lesions involving the bladder and part of the ureter at the same time could be treated by this method. Finally judging from the experimental results obtained, bilateral uretero-intestinal anastomosis with a temporary or permanent cutaneous fistula could replace advantageously the other uncertain methods which have hitherto been used.

The author admits that, although serious post-operative complications have not occurred in his series of experiments, the possibility of their occurrence as with the other methods is not excluded. However, the absence of complications under the circumstances justifies the preference for this method which does not require a special surgical dexterity or instrumentalism.

Riccardo Krieger, M.D.

BLADDER, URETHRA, AND PENIS

DeLly, G. The Surgical Treatment of Diverticula of the Bladder. *Br. J. Urol.* 940, 94.

The necessity of surgical treatment for bladder diverticulum arises when there are disturbances of micturition. These become more pronounced when the diverticulum grows large and difficulties occur in the passage of urine, or when infection develops. It cannot be treated as long as the diverticulum is there. Treatment becomes of greater importance when the ureter opens into the diverticulum, because then the renal pelvis will sooner or later become infected. However, there are diverticula of which the patient has no knowledge and which are usually discovered incidentally during cystoscopic examination.

Conservative treatment by bladder irrigation, internal antiseptics, and continual catheterization may be tried, but only temporary results can be expected, even in cases in which the emptying of the bladder is not hindered, or in which the obstruction can be treated as strictures. However, when the obstruction prevents difficult treatment, prostatic hypertrophy, the grave symptoms of diverticulum will not be relieved by conservative

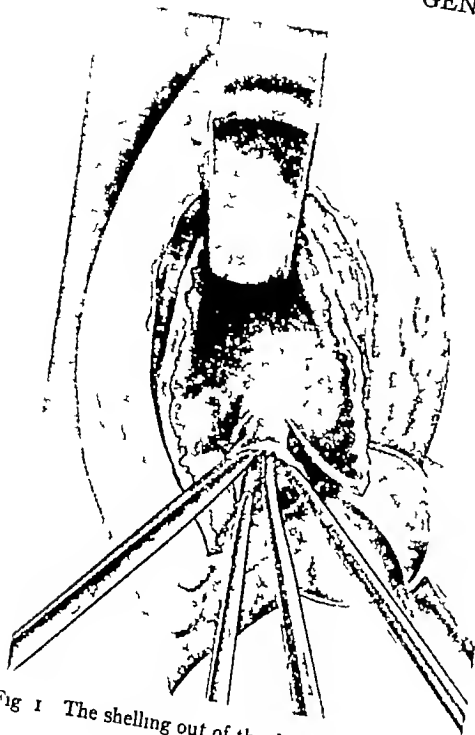


Fig 1 The shelling out of the diverticulum

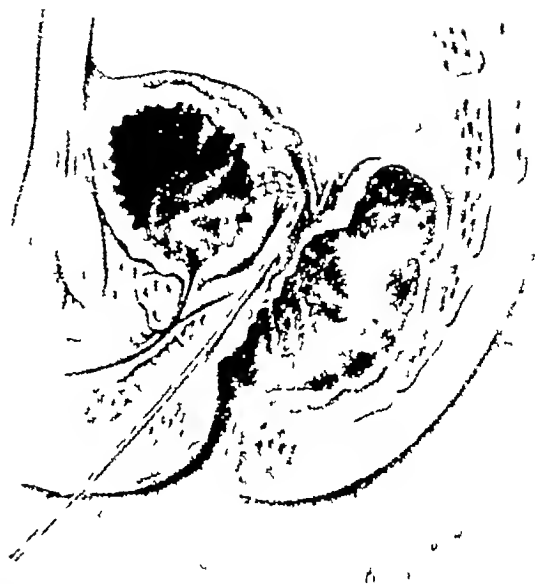


Fig 2 Supplying the bladder wound with transperineal drainage after the extirpation of the diverticulum

treatment In these cases surgical treatment is indicated The surgical technique used is as follows A high incision is made into the bladder The pouch is irrigated and an elevator constructed for this purpose is passed into the pouch The sides of the bladder incision are held tense by forceps The wall of the bladder on the side of the diverticulum is freed by both blunt and sharp dissection The usually necessary to open the peritoneum horizontally if it is desired to expose the top wall of the bladder because the peritoneum is only loosely connected with the anterior and lower posterior walls of the bladder, but it is closely connected with the upper wall Therefore, if the abdomen is opened by means of a horizontal incision at the site where the peritoneum closely adheres to the bladder, and a two fingers' breadth of adherent peritoneum is left on the bladder, another horizontal incision can be made parallel to the former one Two free edges are thereby created, and the peritoneal abdominal cavity is closed by sutures The bladder is free as far as the seminal vesicles, or even lower, extra peritoneally When, in this fashion, the depth at which the diverticulum lies has been reached, the wall of the bladder is cut with a straight scissors all the way to the opening of the diverticulum The opening of the pouch being firmly held by forceps, the wall of the bladder being encircled by an incision through the entire thickness of the wall, the diver-

ticulum is then separated from the outer wall of the bladder The extremity of the metal elevator, which has been passed into the pouch previously, can be easily felt and serves as a guide to its depth The infected bladder and diverticulum unavoidably come in contact with the edges of the incision For this reason, arrangements must be made for drainage, moreover, the sutures of the horizontal incision and corresponding sides of the bladder cut to the opening of the diverticulum will invariably let through some urine In this case the soft parts are punctured with a blunt instrument The lower edge of the os pubis must be located and a spot which is from one to two finger breadths to one side of the middle of the symphysis When the end of the instrument is felt in the perineum, an incision the size of a buttonhole is made through which the instrument is pushed A suitable drainage tube is applied and drawn into the wound behind the bladder

After the operation for simple diverticulum, treated and drained as above, the bladder incision can be closed if provision is made for bladder drainage by an indwelling urethral catheter

In 2 cases in which the diverticulum was closely adherent to the surrounding tissue and rectum, the neck between the pouch and bladder was cut through and the bladder closed, which resulted in a segregation of the diverticulum, which was treated from

above. One patient was seen a year later when the bladder wound was closed, and the diverticulum communicated to the outside through a small moist fistula above the symphysis.

In older patients in whom there is prostatic hypertrophy with difficulty in emptying the bladder a prostatectomy is performed, followed by extirpation of the diverticulum at the same sitting. This seems to be simpler than performance of the operation in two steps, for if the prostatectomy is done alone, healing will be hindered and there will be danger from the infected diverticulum. If the diverticulum is operated upon first and the bladder is extensively freed there will be adhesions which will impede reopening and interfere with the proper procedure in dealing with the peritonium.

In cases in which the ureter opens into the diverticulum or runs along the wall, the ureter should be cut near the bladder so that later it can be transplanted into the bladder without tension.

JOHN A. LOTT, M.D.

Nesbit, R. M. and Gordon, W. G. The Neurogenic Bladder. *Prostetologia* 11: 349, 43, 36.

Neurogenic disorders of the bladder consistently fall into such well-organized patterns that they may be classified into definite groups which correlate consistently with the level and the extent of the nervous system lesion. There are four such groups. Each has characteristic symptoms and cystometric findings.

The uninhibited neurogenic bladder. The patient presents symptoms of frequency and urgency both day and night. Enuresis and precipitant micturition occur occasionally. Bladder sensation is normal. The capacity is less than normal. The patient has voluntary control of the external vesical sphincter. There is no residual urine. Uninhibited contractions of the detrusor muscle occur during the fill and are interpreted as desire to void. This group is found in two main groups of patients presenting different etiological factors, the congenital and the acquired.

In the congenital group in which normal integration of the cerebral inhibitory mechanism has not properly developed, careful history reveals that these patients invariably have been bedwetters. Rational treatment should be toward depressing the bladder reflex, the overactivity of which is responsible for the difficulty. Stimulation of the sympathetic by the use of ephedrine could appear to be the obvious therapy although no lasting benefit occurs from the continued administration of this drug.

Depression of the parasympathetic reflex by the administration of atropine has proved particularly effective.

The acquired uninhibited neurogenic bladder results from the loss of bladder inhibition due to the development of central nervous system lesion, such as subtotal destruction of cerebral cortex, or subtotal destruction of spinal-cord pathways subserving

the function of micturition, resulting in this bladder disorder. The loss of bladder inhibition may be seen in the following central nervous system diseases: hemiplegia, brain tumors, involvement of the ascending and descending cord pathways in multiple sclerosis, and pernicious anemia.

The uninhibited neurogenic bladder of acquired origin is less responsive to drug therapy.

The reflex neurogenic bladder. This condition is result of profound disturbances in the supraspinal reflex pathways or centers in the brain or cord, e.g., complete transection of the spinal cord. The removal of higher center control converts the bladder into a simple reflex organ.

The functional characteristics are reflex and involuntary micturition and inability to initiate or cease micturition. Bladder sensation is lost. The residual urine varies from 150 cc. to 1000 cc. Diffuse cord lesions producing subtotal destruction of the pathways usually allow a fairly satisfactory capacity of the bladder; however a reflex bladder of small capacity less than 100 cc. is the most common type found. The most important factors in reducing the capacity are infection and calcareous disease.

Treatment of the reflex neurogenic bladder consists of the prevention or elimination of infection or calcareous disease. Drug therapy has been unsuccessful in most of the cases.

The autonomous neurogenic bladder. This condition results from an interruption of the sacral reflexes which controls the bladder by involvement of the complete sacral cord, conus, conus equinus, or the sacral plexus. Normal sensation is gone, voluntary or reflex micturition is abolished. The detrusor tone is maintained, and the internal sphincter tone is normal or hyperactive. The bladder all times is normal trabeculation. Evacuation is by overflow. The bladder always contains residual urine.

The treatment is directed primarily toward reduction of the high residual urine. Many patients have been made satisfactorily continent by periodic forced evacuation either by diaphragmatic force or by compression of the lower abdomen.

Other procedures are transurethral resection of the hypertrophied internal sphincter or reduction of the internal sphincter resistance by the performance of presacral neurectomy.

The atonic neurogenic bladder. This condition results from interruption of only the sensory limb of the reflex arc, the motor arc being left intact. The tone is secondary to prolonged overdistention, due to lack of sensation and desire to void. The atonic neurogenic bladder is seen in tabes dorsalis, dorsal root involvement of pernicious anemia, and multiple sclerosis, diabetes, syringomyelia, progressive muscular atrophy, and acute traumatic myelitis.

Functional characteristics are loss of sensation, complete atony of the detrusor mechanism, a great capacity of the bladder and overflow incontinence. Voluntary micturition occurs only with straining, and large amount of residual urine.

constant Cystoscopic examination discloses a finely trabeculated bladder wall with a relaxed internal sphincter

The treatment is directed toward two ends

First, preservation of bladder tone This is important in the atonic bladder of spinal shock In early cases education of the patient to void periodically by straining and the Credé procedure will provide a highly satisfactory degree of continence with preservation of the muscle tone

Second, reduction of the amount of residual urine in the advanced cases by

1 Perinec evacuation of the bladder augmented by suprapubic pressure,

2 Drug therapy (an endeavor to stimulate detrusor activity by parasympatheticomimetic drugs Mecholyl bromide, prostigmin, and gynergen have been used without success),

3 Constant drainage by urethral catheter or suprapubic cystostomy employed in bedfast patients whose incontinence and infection have been a menace to their existence, and

4. Neurectomy, which is done to lower resistance to the urinary outflow Postoperative cystometric studies have shown no change in the bladder tone

The treatment is summarized by the following principles

1 Avoidance or removal of infection of the urinary tract

2 Eradication of other irritative lesions

3 Reduction of the residual urine

4 Development of periodic voiding and complete or incomplete incontinence JOHN A LOEF, M D

Thompson, G J, and McDonald, J R Benign Tumors of the Urinary Bladder Report of a Case of Neurofibroma *J Urol*, 1940, 43 831

Neurogenic tumors that arise in the genito urinary organs are exceedingly uncommon The diagnosis of such tumors is important because of the relatively benign course of the majority of neoplasms of this type The only reports of tumors of the bladder of the neurogenic type made heretofore are to be found in the German literature

Steden (1923) reported a case of ganglioneuroma of the bladder in which ganglion cells were present Hensch, in 1926, reported a case of neurofibroma of the bladder associated with generalized neurofibromatosis The description of bundles of smooth muscle in this tumor together with the drawings leaves some doubt as to the nature of this tumor Heidler (1928) described a case of neurofibroma of the bladder associated with generalized neurofibromatosis

The clinical course in the case reported together with the physical findings was suggestive of a diagnosis of huge intravesical projection of the median lobe of the prostate gland The correct diagnosis, however, would appear to be neurofibroma arising from the plexus of nerves which supply the posterior surface of the bladder near the prostatic juncture The tumor was much larger than the two neuro

fibromas and the ganglioneuroma of the bladder which were reported previously in the literature

GENITAL ORGANS

Gutierrez, R The Changing Conception of Cancer of the Prostate *Am J Surg*, 1940, 48 330

The author reviews statistics on the incidence of cancer of the prostate Until recently this malady was faced by urologists with a defeatist attitude In the past few years, however, the outlook has changed

The author divides prostatic carcinomas into three therapeutic groups

1 Silent or occult cases in which a small nodule of cancer exists without symptoms or metastases For these, he advises perineal prostatectomy

2 Circumscribed cases In this group urinary symptoms have appeared, the prostate, however, is not fixed, and the lesion is still circumscribed to the gland and has not extended beyond the limits of the capsule These, he states, are still operable

3 Diffuse cases, carcinosis These comprise 90 per cent of the total cases The process has extended beyond the capsule, or frank metastases are present The patients should be relieved of their painful symptoms and of urinary obstruction by transurethral resection After the operation they should receive deep x-ray treatment to control the metastases and to relieve pain and urinary distress

Gutierrez advocates yearly rectal examinations of all males more than fifty years of age He believes the prognosis for a five-year cure is greatly improved under this newer conception of management THEOPHIL P GRAUER, M D

Stevens, A R, and Barringer, B S Sarcoma of the Prostate *J Urol*, 1940, 44 83

Case histories of 16 patients with sarcomatous prostatic growths diagnosed either clinically or by microscopic section are reviewed by the authors in an attempt to clarify existing views on an uncommon, yet important disease entity While 4 cases are presented with favorable results, the larger group represents a discouraging record in which diagnosis was made late in the disease with a rapid down-hill course, temporarily impeded in a few instances by x-ray therapy

A simple and useful pathological classification based on the origin of the tumor is propounded

1 Liomyosarcoma and rhabdomyosarcoma, taking origin from the musculature of the prostate These two tumors are much alike in growth and clinical manifestation

2 Lymphosarcoma, from the lymph tissue in the prostate This was formerly a disputed entity, but is now generally recognized

3 Sarcoma of an undetermined origin—spindle, fibrous, myxomatous, round-cell, and giant-cell sarcomas

4 Clinically, a fourth group, not sarcomatous but representing anaplastic carcinoma, is considered

because it has various features resembling sarcoma and is often mistaken microscopically for lymphosarcoma.

In 4 cases of sarcoma, the initial diagnosis of prostatic cancer and incision and drainage were attempted. Of 5 cases of myosarcoma, proved microscopically, 3 were diagnosed as benign hypertrophy and subjected to prostatectomy. The less malignant sarcomas, especially myosarcoma, may suggest benign prostatic hypertrophy in older men.

While the most malignant are found in younger individuals and the diagnosis may be inferred by the gross brief history, great size of the gland, elasticity and perhaps irregularity of contour (about the relation, as well as the presence of a suprapubic mass connected with a prostatic tumor). Loss of weight and cachexia frequently occur.

A differential diagnosis must be made from bladder cancer, cyst, and carcinoma of the prostate. The diagnosis of a large bladder tumor and retroperitoneal sarcoma may be aided by the use of the aspirating needle, aspiration biopsy and an x-ray therapeutic test, in addition to the usual urological examination.

In practice two groups of cases are recognized: those not diagnosed until after prostatectomy for supposed hypertrophy and usually of a low degree of malignancy; and the unusual and large tumors of high degree of malignancy. Experience has shown the superior value of irradiation over surgical procedures in such instances.

ARTHUR H. MELBY, M.D.

Counseller V. S., and Bedard R. E. Sarcoma of the Prostate Gland. *J. Urol.* 94, 43, 836.

Sarcoma of the prostate gland is admittedly rare disease. There have been reports in the medical literature of some 60 verified cases. The most common lesion reported has been round-cell sarcoma.

which comprises approximately one-quarter of the cases. The next in frequency is spindle-cell sarcoma. There have been 11 cases of lymphosarcoma, including those of Coupland, Kaufmann, Conforti and Frost, Quinby, Symmers, Zeno and Ercole, Mason, Ferguson and Stewart, Cole and Martin, and Smith and Torgerson. Leiomyosarcoma, rhabdomyosarcoma, angiosarcoma, and fibrosarcoma have been reported also.

The incidence by age has varied tremendously. The youngest patient is a newborn infant and the oldest was aged eighty-eight years. Almost half of the patients have been under the age of twenty years and the majority have been under the age of forty. The duration of life of the patient subsequent to the diagnosis of sarcoma of the prostate gland is approximately nine months, regardless of treatment. The average life of patients less than thirty years of age who have this lesion is even less than nine months, and the cytological type of sarcoma does not appear to alter the prognosis.

The best results with irradiation were reported by Bumpus who presented 5 cases in 1935. There have

been 9 verified cases of sarcoma of the prostate gland at the May Clinic up to the present time 5 of which were reported by Bumpus before the American Urologic Association in 1935. The 4 additional verified cases have been encountered between the years of 1935 and 1938.

In our hands the most favorable results in the treatment of sarcoma of the prostate gland have been achieved by partial prostatectomy followed immediately by the use of radium and roentgen ray.

Rea, C. E.: A Further Report on the Treatment of the Undescended Testes by Hormonal Therapy at the University of Minnesota Hospitals. *Am. J. Surg.* 94, 7, 89.

Despite previous reports showing a high incidence of successful results following the treatment of undescended testes with gonadotropic substances after up to 75 per cent the author has noted successful results in not more than 20 per cent of a series of cases of retained testes treated at the University of Minnesota Hospitals. Of 36 undescended testes treated, 7 descended, representing 19.4 per cent success. There was no uniformity of dosage or length of treatment but 12 patients received at least 3,750 units of substance like that obtained from the anterior lobe of the pituitary gland during their courses of treatment.

It is interesting to note that several of the patients received 500 units of the hormonal substance intramuscularly every day for ten days and patient, nine years of age received total of 5,000 units of antefolins-S over a period of four and one-half months without descent of inguinal ectopic testes. The author noted no untoward reaction in any of the cases which were given larger doses than previous series of 36 cases. Emphasis is placed on the absence of excessive genital growth in any of the patients under treatment.

It is impossible to give a final estimate of the value of gonadotropic substances in the treatment of ectopic testes at the present time. Primary factor being the inability to evaluate the incidence of spontaneous descent. Further it must be determined whether endocrine therapy causes descent only of those testes which could descend without therapy at the time of puberty. Hormonal treatment makes it possible to differentiate between those testes which require surgery because of mechanical obstruction to descent and those that do not.

The author believes that treatment should be deferred until the patient is from nine to eleven years of age, since the testes do not grow grossly or microscopically until then (Wangenstein) and also since it is possible that spontaneous descent may occur. At the present time the therapeutic regime consists of the administration of anterior-pituitary-lobe-like substance in doses of 500 rat units per cubic centimeter every day or every other day for injections. If no result is obtained, the patient is given one month rest and similar course of therapy instituted. If no result is then noted, an additional

rest of from three to six months is ordered, for possible delayed descent. If unsuccessful, orchiopexy is performed. The author believes that the danger of precocious puberty is more apparent than real following the use of gonadotropic substance, if the patient is carefully watched.

Spontaneous descent or descent following the use of gonadotropic substance in cases of true undescended testes is a rare occurrence in the experience of the author. At this clinic, every case of true undescended testes upon which an orchiopexy was performed showed evidence of mechanical arrest of the gonad.

ARTHUR H. MILBERT, M.D.

Gilbert, J. B. Studies on Malignant Tumors of the Testes. Differential Diagnosis of Clinically Obscure Tumors. 4 Cases and a Review of 122 Cases from the Literature. *J. Urol.*, 1940, 43, 722.

The basis of this report consists of 122 cases taken from more than 7,000 cases of tumor of the testes analyzed by MacCarthy, and 4 previously unpublished cases. These tumors occurred in normal or smaller than normal-sized testes and constituted about 1.5 per cent of the total number.

The average age of these patients was thirty-two and one-half years. Forty-eight tumors occurred in the right testis, 35 in the left, and 2 were bilateral. A history of trauma was obtained in 12 per cent.

The tumor was unicellular in 36.5 per cent. Eight of these patients were known to be alive for an average of eighty-two and seven-tenths months.

In 71 patients the tumor was teratoid in type. Of these, 29 had teratomas and 2 of these are known to have survived for ten years, 42 had chorio epitheliomas and only 1 of these was alive and well more than six months after operation.

In the clinical diagnosis, scrotal disease was evident on first examination in only 59 patients. Tumor of the testis was diagnosed in 32, while the diagnosis in the remaining 27 included all possible scrotal conditions. In 26 cases with abdominal metastases the condition was believed to be intra-abdominal, the primary tumor remaining unsuspected. The remaining 41 cases were considered to be primary disease of the thorax, head, neck, and extremities.

Hormone assays aided in the diagnosis in 21 of 53 cases since 1932.

Simple orchiectomy was performed on 67 patients, in 24 of whom metastases were already present. Five radical operations were performed, but the results were not stated. Pre-operative and post-operative radiation therapy was given to 40 patients.

ANDREW McNALLY, M.D.

MISCELLANEOUS

Batchelor, R. C. L., Lees, R., and Thomson, G. M. Sulfonamide Treatment of Gonorrhea. Results of Treatment. *Brit. M. J.*, 1940, 1, 961.

The author reviews the results in 810 male and 129 female patients with gonorrhea treated with

sulfanilamide, uletron, albucide, M 541, and sulfapyridine. All the cases were diagnosed and controlled bacteriologically, principally by the examination of smears, but by culture also in doubtful cases.

A definition of terms employed in this study follows.

Drug resistance—The phenomenon in which the disease is partially or completely unaffected by the drug.

Relapse—A return of symptoms and signs with positive bacteriological tests.

Return Case—The case of a patient who has been discharged as cured or defaulted and who has subsequently returned to the clinic.

Defaulter—Any patient who ceases to attend the clinic before all tests of cure are satisfactory.

THE ROUTINE MANAGEMENT OF GONORRHEA IN THE MALE

Before treatment, a full clinical examination is made and smears of the urethral discharge are examined by the Gronis method. If doubt exists as to the diagnosis, cultures are made. Administration of the drug is started as soon as the diagnosis has been established. No irrigations are used.

Points emphasized in the treatment are

1. Exact dose prescribed must be taken.
2. The drug must be taken at the prescribed intervals.
3. Tablets must not be given to another person.
4. Enough of the drug is supplied to last until the next visit.

5. Observation must be regular and at frequent intervals—every two days during chemotherapy, then once a week until cure is established.

Tests of cure are carried out during the latter part of the observation period. The period of observation after cure should be not less than three months. The test of cure consists of repeated urethral and prostatic smears, the passage of large bougies, urethroscopic examinations, provocative injections of gonococcal vaccine, and repeated gonococcus fixation tests.

Sulfapyridine is greatly superior to other drugs of the series, it produces a more rapid curative effect, its toxic effects are less severe, drug resistance is less common, and complications are similarly low, being 13.7 per cent in the sulfanilamide series and 4 per cent in the sulfapyridine series.

Drug resistance was observed in 116, 32.4 per cent, of 358 cases treated with sulfanilamide and in 24, 5.7 per cent, of 417 cases treated with sulfapyridine. Conclusive observations on the cause of primary drug resistance cannot be given at this time.

If insufficient dosage of a sulfonamide is employed for even a short time, the gonococcus quickly becomes resistant to all sulfonamides. This drug resistance is retained for several weeks or months. It appears essential to give large doses of all sulfonamides at the outset and reduce the dose after a high blood concentration has been obtained.

THE ROUTINE MANAGEMENT OF GONORRHEA IN THE FEMALE

Sulfonamide treatment of gonorrhea in women is discussed separately. In all cases smears of the urethra, cervix, Bartholin glands and vagina are taken. In case of doubt secretions are cultured. Tests of cure are conducted over a period of three months.

Sulfonamide is given immediately after the diagnosis has been established. The doses tolerated are less than in the male cases.

The percentage of cure is higher with sulfanilamide than with sulfapyridine, the latter however showing a lower incidence of complications and involving less drug resistance.

Relapse occurred in patient treated with sulfanilamide and treated with sulfapyridine

OTHER SULFONAMIDES

Ulcron (Bayer) gives its best results in delayed therapy only. It has tendency to damage the peripheral nerves.

Albucide (Schering) is a modification of sulfanilamide given with view to reducing toxicity. Its curative action on the gonococcus is much weaker than sulfanilamide.

M 34 (I. C. I.) or sulfanilamide-ethyl-sulfonate is a compound of low toxicity but of very feeble curative power.

JOHN A. LOUR M.D.

Lehr, S. M. Late Relapse Following Treatment of Gonorrhea with Sulfapyridine. *Brit M J* 940, 907

The author in study of 6 cases of rethritis in the male treated with from 9 to 15 gm. of sulfapyridine given at the rate of 3 gm. daily in divided doses reports a recurrence of symptoms in 3 cases

after a clinical cure had been achieved. The evidence in 3 of these cases indicated re-infection, and thus the incidence of relapse as 1 of 6 cases, a rate of 7.5 per cent. Six of these occurred during the first month and are classified as early relapse. Such leaves 6 cases of late relapse or a rate of 37 per cent.

The criteria of clinical cure used in this series were the absence of urethral discharge. When examined at least 4 hours after urination, the finding of clear urine in both the first and second glasses, urine free from shreds and debris, and the absence of mucus.

The clinical findings of relapse are variable. Acute urethritis with gonococci demonstrable in the urethral pus may occur. While in other cases only scanty discharge containing pus and epithelial cells accompanied by clear urine is found. In still other cases the relapse takes the form of acute complication.

In 4 cases of relapse a closed focus of infection as discovered and ultimate cure obtained only after these foci were eradicated.

In 3 cases the first cure followed the administration of only 9 gm. of sulfapyridine, the subsequent cure being accomplished with further adequate doses of sulfapyridine.

The prophylaxis of late relapse includes adequate sulfapyridine therapy combined with retinal irrigations. In addition, it is important to enlist the cooperation of the patient by avoidance of sexual excitement and ingestion of the tablets.

These methods combined with thorough tests of cure and detailed chemical and bacteriological study of the urethra and the associated structures can do much to reduce the incidence of relapse.

JOHN A. LOUR M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC

Ingelrans, P., and Laine, E. Osteochondritis Dissecans (L'ostéochondrite disséquante) *Rev d'orthop*, 1939-1940, 26 645

Ingelrans and Laine note that osteochondritis dissecans is a form of foreign body of the joint. It is a unique type, as the foreign body is a true sequestrum detached from the epiphysis which secondarily enters a joint cavity that is apparently normal, other foreign bodies arise in diseased joints.

In a case of osteochondritis dissecans recently examined, there was no history of trauma, the patient was a man twenty four years of age. For seven years he had occasional pain in the left knee but in the last two weeks the pain had become increasingly severe. On examination, the knee was not swollen and the movements of the joint were normal except for a slight limitation of flexion. On palpation, severe pain was elicited by pressure at a point on the internal condyle in front of the point of the patella. Roentgenographic examinations had been made previously on several occasions, the first roentgenogram made seven years previously showing only an area of decalcification on the axial surface of the internal condyle. The last roentgenogram showed the typical picture of osteochondritis dissecans, with a fragment about 2 cm. in length definitely separated from the bone. The rest of the joint was normal. This fragment was removed, with complete relief of pain. The function of the joint three months later was normal and the patient could walk with ease.

This case was typical of osteochondritis dissecans, which usually occurs in young men living an active life, yet it was not associated with any definite history of trauma to the joint. The symptoms also were typical, they were pain in the joint, not severe and not definitely localized. There may be a feeling of insecurity in the joint which interferes with comfortable walking, but there is little if any limitation of movement. The elicitation of severe pain by pressure on a definite, well localized point is characteristic of osteochondritis dissecans. There may be an associated muscular atrophy. The roentgenographic examination in the earlier stages shows a subchondral niche, enclosing a sequestrum more or less definitely separated from the bone. The definite separation of the sequestrum and its appearance as a foreign body in the joint cavity may be followed roentgenographically. As this occurs, the pain in the joint becomes more severe and more constant, and hydrarthrosis becomes more marked and develops more frequently. There may also be more definite interference with movements of the joint, even occasional complete blocking of the joint, which is only temporary. When completely separated from the bone, the foreign body is often easily perceived,

often by the patient himself. In many cases of osteochondritis dissecans, the complete clinical picture of a joint foreign body does not develop, but the symptoms remain those of a chronic arthritis or a meniscal lesion without marked limitation of joint movements or blocking of the joint, or marked hydrarthrosis. Osteochondritis dissecans usually affects the knee, rarely the hip or the shoulder.

The treatment consists in the operative removal of the foreign body. Microscopic examination shows it to consist of three layers: normal cartilage on its articular surface, a central layer of spongy bone, entirely necrotic, not containing any normally staining bone cells, and a third layer of newly formed fibrocartilaginous tissue. The last layer is present even if the sequestrum is not entirely detached from the epiphyseal bone. The pathogenesis of osteochondritis is obscure, the synovial fluid apparently plays some rôle in the formation of the sequestrum, but the cause of the original lesion is not known.

ALICE M. MEYERS

Glissan, D. J. Deformities Affecting the Lower Radial Epiphysis. *Australian & New Zealand J Surg*, 1940, 9 337

The author calls attention to the fact that the original description of Madelung's deformity covered several diverse conditions, but it is likely that it referred particularly to a condition which had as its main feature forward projection of the distal end of the radius. Forward deviation of the lower end of the radius is rare. It may be due to a fracture of the shaft of the radius or to a growth disturbance of the epiphysis. The cause of the latter type is obscure. The radius appears to be actually lengthened as the result of overgrowth.

In a second and contrasting deformity affecting the lower radial epiphysis the radius is shortened. The hand is displaced radially and the head of the ulna is prominent. The underlying pathology is a slowing down and premature cessation of growth at the distal radial epiphysis. The condition is more common than a true Madelung's deformity. The deformity is unsightly and leads in some cases to such weakness and disability as to cause the patient to undergo operation readily. The uniformity in all the features of this deformity suggests a specific cause, but none is known. The clinical history which is usually obtained shows that the initial trauma is a slight one. A precisely similar condition, described by McFarland, affects the lower tibial epiphysis. In the treatment of the deformity at the wrist the author shortens the ulna with very satisfactory results. The operation is done with the reservation that a future final shortening may be necessary when the growth of the ulna has ceased.

The third deformity discussed is the rare anomaly of complete medial displacement of the hand. In the

thor' case the hand was carried to right angle to the forearm and the articular surface of the radius directed exactly medially. An infectious cause as possibility in this case because there were signs of an old infection in the lower part of the forearm and evidence of an old osteomyelitis near the knee joint. A diagram of the template used for the osteotomy bringing the distal end of the radius to its normal position is presented.

Röntgenograms showing the deformities discussed and some postoperative results are included.

ROBERT P. MONTGOMERY, M.D.

Dubau, R., and Bolot, F. Remarks on 11 Cases of Subastragaloid Tuberculosis in Young Adults (Sur onze observations de tuberculose sous astragalo-humera chez l'adulte jeune). *Presse med.* Pa. 940, 45: 5-9.

This article comes from the surgical tuberculosis service of the French Army at the Percy Hospital. The calcaneo-astragaloid joint (talocalcaneal articulation), is composed of anterior and posterior parts, which have separate synovial linings and which are separated by the interosseous ligament. The main purpose of this article is to show that tuberculous involvement of the posterior part of the joint has benign prognosis and responds to simple treatment. This is not true of tuberculous involvement of the anterior part when it is complicated by an osteoarthritis of the tibiotarsal joint (talocrural articulation) nor of the anterior part when there is serious disease of the transverse tarsal articulation (Chopart). Of the cases under discussion 5 showed involvement of the anterior subastragaloid and the internal part of Chopart's articulation, of the posterior part of the subastragaloid joint, and 4 of the posterior subastragaloid and the tibiotarsal (talocrural joint) joints.

The diagnosis of tuberculous subastragaloid arthritis depends on clinical picture usually in an individual who has had tuberculosis in other parts of the body. Of 3 patients with tuberculosis involving the foot, 2 had evidence of the disease elsewhere. In the cases discussed in this article, 9 had had evidence of tuberculosis in other parts of the body. The lesions in the foot develop slowly and give characteristic roentgenological appearance. Positive evidence of the nature of the disease is the demonstration of tubercle bacilli in the pus from fistulas, in other parts of the body, in the sputum, and in aspirated stomach secretions. The authors place great confidence in this last means of finding the bacilli, even when the sputum is negative and when the roentgenograms of the chest appear normal. In the cases, the tubercle bacillus was found 5 times in pus from local abscess, twice in pus from an abscess elsewhere in the body, twice in the sputum, and 3 times in aspirated stomach contents. The objection has been made that bacilli are apt to be found in the stomach contents of a patient placed in close contact with other patients who are tuberculous, but the authors cite the case of Tunisian

who in contact for one and a half years, who constantly had negative sputum tests and never showed tubercle bacilli in his stomach content.

The treatment is of a general nature along with orthopedic immobilization. In the event this does not give satisfactory result, an attempt must be made to salvage as much of the foot as possible. In the presence of involvement of the anterior subastragaloid joint, midtarsal amputation was done in 5 cases, and secondary amputations were necessary in 4 cases in each the result was satisfactory. When the posterior part of the joint is involved with the tibiotarsal joint, astragalectomy may give good results, although the authors believe that the astragalus should be sufficiently resected to form a sequendum. When the posterior part of the joint only is involved, simple immobilization should be sufficient, but in 5 cases astragalocalcaneal ankylosis was necessary.

ARMAND VANDERVOORT, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Rostock, P. Indication for Operation on the Knee Joint (Indikation zur Eröffnung des Kniegelenkes). *Deutsche Ges. f. Chir. Berlin*, 910.

The operative removal of a foreign body in osteochondritis is recommended not only when the body is loose but also when the demarcation process is visible in the roentgenogram. The earlier operation is performed, the better are the end results. The roughened edges of the defect from which the joint mouse came should be smoothed. The joint cartilage must be removed by operation in the majority of cases, which is done with regard to the conditions present and the site of development of the tumor in the synovia. Degeneration of the patellar cartilage is assumed to be frequent. When conservative treatment by various physical methods does not lead to a satisfactory end-result, operative interference is advised for degenerative cartilages.

Severance of the meniscus tissue may take place slowly when due to degeneration or rapidly when due to an accident causing tear. If the tear is located in the vascular area the meniscus will heal. If the tear is in an avascular area it will not heal, as seen in these separate dissections to degeneration. The tear is ordinarily limited and confined in contrast with the possibility of spontaneous healing. If there is any question of the tear being due to degeneration, the operation is indicated to remove the loosened piece of cartilage. The diagnosis of meniscus tears is difficult. A very accurate history, careful physical examination and roentgen study of the joint by means of a contrast medium are necessary. If the previous evidence is positive more evidence will not be needed for operative intervention. In questionable cases Payr-Sandwich recommended otherwise muscle-splitting incision on the inner side of the joint should be made without division of the lateral ligaments.

According to statistics the end results are not satisfactory in 50 per cent of the cases. After

removal of the meniscus regeneration takes place, which ordinarily brings about an almost complete and normally formed meniscus. The results of each interference on the knee are important from the standpoint of observation and the corresponding treatment in the so called sensitive knee joint. The infiltrative or fibroplastic condition can be healed by conservative means, but in the granular condition the excision of the pathological capsule is necessary. Interference will also be necessary in the treatment of stubborn residual pathology of the knee joint. Arthrotomy may be indicated. It should be considered only when all diagnostic aids are exhausted, the diagnosis is made by this means in order that the proper treatment may be carried out. Sprains and partial tears of the lateral ligaments of the knee joint ordinarily heal following conservative measures. In complete tears, the lateral ligaments must be repaired operatively. This repair should be done by means of braided silk or fascia. In injuries of the crucial ligament the posterior crucial ligaments ordinarily heal spontaneously because of the good vascular supply. Tears of the anterior crucial ligaments from their origin at the tibia do not respond well to operative interference. The vascular supply to the middle portion of the anterior crucial ligament is poor, and frequently degeneration occurs which makes plastic substitution necessary. The possibility of healing in these tears is better than one might anticipate. The blood supply must be insured by combining the plastic material with the synovia.

According to SCHLAFF, this operative exposure was introduced by himself in 1935 (*Arch f klin Chir*, 183 p 657), when a series of 65 knee joints were explored. He advises that the strictly capsular cases should be brought to operation, the earlier they are treated the more favorable the results will be. The cases should be separated into two groups: those in which the process has extended over the cartilage and those in which it covers the bone. The operation does not produce the best results in those cases in which the joint surfaces are dried up. As in peritoneal tuberculosis, operation is useful only in the exudative phase. The real value of exposure by means of operation is diagnostic certainty and, therefore, the institution of proper treatment. The exposure reveals as much inflammation as in tuberculosis. In one case in which another clinic had designated the condition as unquestionable tuberculosis, operation did not confirm the diagnosis. Some joints show little clinical evidence under anesthesia and when operation is performed a widespread tubercular tuberculosis is found. The exploration never injures but insures a clear diagnosis without limitation of function. Schlaff demonstrated 3 cases which for nine years gave evidence of satisfactory healing, complete preservation of function, and solidity of the operative joints. No joint infections were observed in the 67 cases operated upon.

LAUBER states that in the experience of the Marburg Clinic in the conservative treatment of empyema of the knee joint, the best results are obtained by

means of irrigation with rivanol when the suppuration is limited to the anterior portion of the joint. If, upon the other hand, the posterior portion is involved, then one or two incisions must be made according to the method of Kroh.

ERB emphasizes the necessity of recognizing muscle atrophy and of considering the question of life insurance. When there is atrophy a less satisfactory operative result may be obtained. The lateral S-incision of Payr does away with the possibility of sensory disturbances. It is very useful for almost all interventions on the knee when there has been drainage from the capsule. However, this operation is also useful when there have not been any preceding discharges. Emergency operation may be performed through the small medial incision of Kirschner. The latest muscle-splitting incision of Panthel and the short nerve sparing incision can be done only when the exact location of the operative site is known, which is not often the case. It is only in certain cases that injury can be avoided to the musculature. Extirpation of the free bodies in osteochondritis is not all that is necessary. The defect from which the joint mice had their origin must fill in and be smoothed. In patellar chondropathia it must be decided by probing, whether or not bony resection should be carried out. The softening of the bones goes beyond the torn degenerating part. Narcosis is not necessary for the loosening of the meniscus per se as it relaxes spontaneously under anesthesia because of loss of conduction of the sciatic and femoral nerves (Madlener and Schoenhauer).

(P. ROSTOCK) RICHARD J. BENNETT, JR., M.D.

Vandendorp, Bastien, and Vandecasteele. Late Results of Meniscectomy (*Résultats éloignés des méniscectomies*). *Rev d'orthop*, 1939-1940, 26 629.

Vandendorp, Bastien, and Vandecasteele report 61 cases in which meniscectomy was done, in 58 cases the lesion was traumatic, and in 3 cases a cyst was found. One of the cysts was associated with trauma to the internal meniscus. In most cases the trauma was due to an industrial accident, in some cases to athletics, chiefly football. The internal meniscus was more frequently injured than the external. The two sides were about equally affected.

The chief symptoms of a lesion of the meniscus is blocking of the joint, yet this occurred in not more than two-thirds of the series. It is often not present when the rupture of the meniscus is incomplete. Other symptoms, such as hydrarthrosis of the knee and muscular atrophy, were present with varying frequency. As a rule, meniscectomy is not indicated immediately after an injury, not until at least six weeks after the injury. At that time either blocking of the joint or the presence of a painful point at the site of the injury is an indication for operation, whether other symptoms are present or not. In 2 of the authors' cases operation was done the day after the injury because of irreducible blocking of the joint. This is the only condition that justifies an early operation.

Two types of arthrotoomy were used in the 53 traumatic cases: longitudinal arthrotoomy in the region of the patella in 45 cases and transverse arthrotoomy with section of the lateral ligament (Tavernier method) in 14 cases. The various types of meniscal lesions found in these cases included complete longitudinal and horizontal rupture of the meniscus, incomplete longitudinal and horizontal rupture and avulsion of the anterior or posterior cornu of the meniscus. Longitudinal rupture was more frequent than the horizontal type. The meniscus is not necessarily completely removed; removal of the injured portion is sufficient to restore the function of the joint. The anterior cornu is detached and the removal of the meniscus carried out from the front as far back as necessary.

After operation the extremity is placed in a grooved splint; no plaster cast is used. With the vertical arthrotoomy active and passive movement of the joint is begun by the eighth day combined with massage of the muscles of the thigh and leg; walking is permitted by the twelfth day. With the Tavernier arthrotoomy no movement of the joint is permitted for fifteen days; then active and passive movements are begun. Walking is permitted by the twentieth day.

Not all of the patients in this series could be traced; 19 are known to have died, 49 were re-examined, and roentgenograms were made in 44 of these cases. The examination showed the movements of the knee joint in flexion and extension to be normal and painless in the majority of cases. In 13 cases there was slight limitation of flexion; in 5 cases forced flexion was impossible. In 1 case extension was painful. Abnormal mobility of the joint was noted in only 1 case with slight lateral movement. Kneeling was painful in 13 cases, but in most of these cases the pain was not severe. In 7 cases the patients complained of pain in the knee varying with changes in the weather. Muscular atrophy had entirely disappeared in those operated upon more than 1 year previously. It still persisted to some extent in those operated upon in 1938, i.e. six to eleven months before the follow-up examination.

In general, the results are summarized as follows:

There was complete *restitutio ad integrum* in 25 cases, 2.5 per cent. There was complete return of function of the joint with only slight pain usually of the type associated with changes in the weather in 45 cases, 4.5 per cent. In 13 cases, 2.5 per cent, the function of the joint was equally good, but there was more pain, especially associated with kneeling or crouching. In 5 cases, 5 per cent, there was definite limitation of the joint. The results with the two types of arthrotoomy were about the same.

Roentgenographically 5 of the 44 patients examined showed signs of chronic arthritis, viz., thickening or irregularities of the joint surfaces, yet these signs showed no definite relation to the clinical results. In the 4 cases in which these signs were the most marked, the functional result was excellent and pain was slight or absent. In 1 case there was

osteoporosis of the external condyle of the femur, in 4 cases an intra-articular osteochondral nodule, and in 1 case osteochondritis dissecans with a small fragment in process of detachment. The removal of the meniscus results in the direct contact of the condyle of the femur with the tibial plateau; roentgenographically this is shown by a shrinkage of the joint, but it is not at all evident, especially in cases in which a partial meniscectomy is done. There may be some slight deformity of the femoral condyle or tibial plateau which may tend to mix in the same way as the vertebral surfaces in scoliosis. These roentgenographic changes are due to static modifications in the joint following meniscectomy; they are often not in any relation to the clinical and functional results, which are satisfactory in the majority of cases.

ALFRED M. METZGER

FRACTURES AND DISLOCATIONS

Rooske, L. The Complications of Supracondylar Fractures of the Humerus (Über die Komplikationen der supracondylären Oberarmbrüche). *Orthopedik*, 1930, 20, 464.

Ten of the fractures encountered by the author from 1920 to 1930 are supracondylar fractures (adulthood). The supracondylar intercondylar (T and Y-shaped) fractures which occur especially in the aged are included in this group. The important factor aside from trauma to the skin and muscles, is injury to the nerves and blood vessels, particularly the radial nerve, with resultant ischemic contracture and gangrene.

The most frequent complication is injury of the radial nerve. The hand hangs in forced volar flexion; the wrist and extension of the proximal phalanges of the fingers and opposition of the extended forearm are impossible. Simple contusion of the nerve often recedes quickly. If perfect reposition is accomplished early the symptoms produced by overstretching of the nerve are quickly eliminated. However, if the nerve is destroyed the paralysis continues or becomes more marked and often persists for many months or even years after operation. Delayed paralysis may be produced by pressure of the site of callus formation, by scar tissue, by poor reduction, or by pressure from the dressings, particularly if circular plaster casts are used, and may produce degeneration of the nerve.

The mechanism of injury of the median nerve is similar to that of the radial nerve but because of its anatomical position, lying beneath a thick pad of muscle, this nerve is less often injured. Compression of the blood vessels with disturbance of the circulation is frequent, associated condition. The vascular phenomena govern the clinical picture. True injury of the median nerve produces inability of pronation and flexion of the hand and disturbances of sensation on the volar side of the hand, in the wrist and in the fingers. If good reduction is obtained improvement in the vascular symptoms can be noted after from twenty-four to forty-eight hours.

The ulnar nerve is seldom injured. It may be injured by fractures of the flexion type, which is readily explained by the fact that the distal fragment of bone presses into the sulcus of the ulnar nerve and compresses the nerve. The typical picture of paralysis of the ulnar nerve is the claw position of the hand which is produced by overaction of the extensor muscles.

Serious complications result when blood vessels are injured. The brachial artery or the cubital artery may be damaged by the proximal fragment of the bone. Additional complications are the formation of cubitus varus and valgus and, finally, of traumatic myositis ossificans of the brachialis muscle, a rare complication of supracondylar fracture which is found much more frequently with luxation of the elbow (E. LILJES). EDWARD W. GIBBS, M.D.

Mayer, J. H. Colles's Fracture. *Brit J Surg*, 1940, 27: 629.

It is an unfortunate fact that Colles's fracture has come to be regarded as an injury easy to treat and one that may be expected to give almost uniformly good results. This point of view exists in the presence of from 15 to 20 per cent of imperfect or frankly poor results.

It is true that function may be perfect in the presence of slight persistent displacement, but perfect anatomical restoration is essential to consistently good functional results. In the author's review the final anatomical result was satisfactory in less than half of all cases with displacement, and a careful analysis of the serial roentgenographs in the unsatisfactory cases indicated that the failures were due to inadequate splintage after reduction.

There is an additional element in the original displacement to those ordinarily described that is frequently responsible for inadequate reductions and recurrences of deformities when insufficient splintage is employed. There is a rotation of the distal radial fragment on its long axis, in the direction of supination. This supination twist carries the lower radial fragment around and sometimes away from the head of the ulna, and away from the pronated upper radial fragment. The supination twist is almost a constant part of the deformity in a true Colles's fracture and to obtain a satisfactory anatomical reduction it is essential to pronate the lower fragment during reduction. A powerful twist of the lower fragment into pronation is absolutely essential in these cases. A combined manipulation of traction, forward angulation, ulnar deviation, and pronation twist gives improved results and the ulnar styloid resumes its normal position in those cases in which it was displaced. General or local anesthesia may be used, but muscular relaxation must be complete.

Immediately after reduction a skin-tight plaster cast is applied, it should extend from the metacarpal necks to the middle of the humerus, with the forearm and hand fully pronated, the wrist ulnar-deviated and slightly palmarflexed, and the elbow flexed to a right angle. Particular care is taken in

molding around the lower end of the radius. The plaster is not bivalved or otherwise disturbed. Circulatory disturbances are avoided by instituting active finger and thumb exercises immediately. This type of cast controls the pronation-supination movements of the forearm, and splintage must be maintained in full pronation to prevent redisplacement. The cast is left on for three weeks. A second cast is applied at the end of three weeks. It extends to the elbow and holds the wrist in a straight position. The second cast is worn for two weeks while consolidation occurs.

The author's results following Colles's fracture have been greatly improved since he employs the above principles of analysis, manipulation, and immobilization. The one exception to the above treatment in a Colles's fracture is an accompanying fracture of the neck of the ulna. This condition is best treated with a long arm cast with the forearm in midprone position.

The roentgenological appearance of a supination twist is characteristic. The lower fragment appears in the anteroposterior view to overlap the upper fragment on both sides and to be considerably broadened, and in the lateral view there is an apparent backward displacement.

The author discusses in detail a large experimental series of cases, the mechanism of Colles's fracture, the inferior radio ulnar joint and the important part the fibrocartilage of this joint plays in the occurrence of, and reduction of, a Colles's fracture, and the anatomical, functional, and cosmetic results and complications. Numerous roentgenograms, summary charts, and an explanatory diagram are presented. ROBERT P. MONTGOMERY, M.D.

Buerkle-de la Camp, H. The Functional Treatment of Vertebral Fractures as Compared with the Boehler Method of Vertebral Fracture Reduction (Funktionelle Wirbelbruchbehandlung oder Boehlersche Wirbelbruchaufichtung). 64. Tag d. deutsch. Ges. f. Chir., Berlin, 1940.

From the first of January, 1934, to the first of March, 1940, there were a total of 1,090 recent spinal column injuries in the Bergmannsheil Hospital in Bochum, and among these 631 fractures of the vertebral body were treated. The author, on the basis of this material, has undertaken to carefully compare the results of two forms of treatment. Since Haumann and Magnus have previously reported in detail concerning the functional method of treatment of vertebral fractures, as the latter has been practiced for decades by Loehler and von Bsmann at the Bergmann Institute, the author primarily discusses the results of the reduction method of treatment. In his introduction he first establishes the fact that he has carried out the reduction method of treating vertebral fractures exactly according to the directions of Boehler, and he has similarly been guided by Boehler's directions in the application of the plaster jacket and in the carrying out of the subsequent exercises. On the other hand,

he questions the conception implied by the term functional treatment of vertebral fractures. Under this terminology the author includes not only the immediate usual flat position upon thin mattress placed upon boards for period of from five to seven weeks, in the third week of which the prone position and treatment of the dorsal musculature with heat and massage is started, but he particularly includes the rehabilitation treatment with gymnastics and athletic exercises. After taking into consideration this limitation of the functional method of treatment, he declares himself against calling this treatment vertebral fracture treatment with massage. Moving pictures which were shown when the author read his paper were very enlightening, especially concerning the rehabilitation treatment.

As the roentgenograms showed, it may be accepted as certain that it is possible to successfully reduce vertebral fractures and to reduce dislocations. Attention is called, however to the studies of Lob and Straube which show that reduction is not always uniform, because frequently fragments of the cortical plates cannot be included, which is true especially if the ligamentous connections between the vertebral bodies are injured. In those cases, also, in which there is injury to the intervertebral discs, an incomplete reduction usually results, because prolapsed fragments of the intervertebral discs remain behind and these structures therefore become incapable of bearing the weight of the vertebral bodies. Attention is called particularly to the difficulties which are generally met in the attempt to reduce fractures of spongy bones which have become impacted. Even the immobilization for period of months in plaster jacket, is unable to surmount such circumstances. The author did not carry out the treatment in the plaster jacket for periods as long as eleven months, as has been suggested by Boehler in many cases, but he pursued this form of treatment for periods as long as seven months in cases of severe fractures. It has come to his attention that in the cases observed by him (altogether 93 vertebral fractures were reduced), there was considerable loss of elasticity associated with pronounced stiffness of the spinal column following the removal of the plaster jacket. These conditions are attributed to the prolonged immobilization of the vertebral articulation in hyperextension. In this respect, attention should be called to the fact that with few exceptions the patients treated by the author consisted chiefly of hard manual workers (miners) in whom the so-called work hump appears much earlier than in those engaged in other occupations. Furthermore, this class of workers rarely engage in acrobatic maneuvers even in their daily lives.

Among the 63 vertebral fractures observed, 34 of the victims had spinal-cord injuries at the time of their admission to the hospital. Of the latter group 7 had reductions without showing any improvement in the transverse paralysis following the reduction. In case as observed which had an abrupt

recovery immediately after reduction. On the other hand, in of the cases immediately following the reduction, marked aggravation of the previously mild paralytic phenomena was observed in 5 others of the 10 reduced, paralysis first became evident after the reduction. Of these 6 cases 3 terminated fatally. In this connection attention is directed to the case of Straube in which there was a separation of a superior posterior triangular fragment which became wedged even more firmly in the vertebral canal during the reduction, the author was able to personally observe a similar condition in of the cases in which he had undertaken operative intervention.

The following figures are given for comparison of the two different modes of treatment.

	French method (Lob and Straube)	Reduction (Boehler)
Length of illness in days	30	21.6
Number of days in hospital	43.8	
First disability compensation	33.7	43.4
Permanent disability compensation	19.3	30.3

In this table are presented only those cases in which there was no nerve injury. Especially to be noted is the decided prolongation of the number of days of illness as well as the markedly higher level of compensation rates in the cases treated following reduction. The remarkable difference in these figures, as compared with the statistics of Boehler should, according to the opinion of the author be attributed to the basic difference in the manner of determining compensation as practiced in the Ostmark and as practiced in the Altmühl. As the experiences of the author have shown, the psychic attitude of the injured person plays an important role in the reduction method of treatment of vertebral fractures. The patients with fractured vertebrae who are treated by reduction resign themselves to wearing the plaster jacket longer so that they may preserve their peace of mind further. This fatalistic attitude is attributed to the fact that the injured person has the feeling that he seriously injured himself simply because he has been given so much attention.

On the basis of his extensive experiences, the author is of the opinion that the functional method of treatment of vertebral fractures is still, just as formerly to be regarded as the method of choice, and that the danger of the formation of kyphosis, so greatly feared by Boehler, should not be regarded as the determining factor in the indication for reduction. He believes that the degree of paralysis present is of prime importance in this respect. In his conclusion, he calls attention to the fact that the injured physician, prevented by Boehler was suffering from type of fracture which in reality did not even require reduction, and for that reason this case is not necessarily an argument in favor of the reduction method of treatment. In addition, comparison of functionally treated miners demonstrates the correctness of the functional method of treatment.

(UNPUBLISHED). HARR A. SALZMANN, M.D.

Corrêa do Lago, Jr. Posterior Marginal Fracture of the Upper Plane of the Tibia (*fractura marginal posterior do planalto tibial*) *Rev. brasil de orthop e traumatol*, 1940, 1: 375

Corrêa do Lago discusses a case of isolated fracture of the central portion of the posterior border of the upper tibial plateau. To his knowledge, this type of fracture has not been reported up till now. He discovered this fracture in a woman aged twenty-seven years, who while riding a bicycle struck her left knee lightly against a truck. She experienced only slight pain and continued her journey. When examined two days later, the only anomalies found were an effusion in the joint and moderate pain on digital pressure in the popliteal space over the posterior upper part of the tibia, passive movements were practically painless and there was little interference with walking. Roentgen examination revealed a line of fracture running from the surface of the upper tibia plateau, close to the posterior border, obliquely down and backward and detaching clearly a small fragment from the median part of the posterior border of the bone. The line of fracture was just visible in its upper part and fused with the posterior aspect of the bone in its lower part. A plaster splint was applied from the root of the thigh to the toes, and was left on for two weeks. After removal of the splint, mixed mechanical therapy was given for one week because of rather marked atrophy of the extremity, and the patient was discharged as cured six days later.

The author has no doubt that in this case the fracture occurred by divulsion exactly at the point of insertion of the posterior cruciate ligament the knee being flexed and the tibia fixed on the pedal of the bicycle, the blow on the anterior part of the knee caused a sudden backward displacement of the femur, and the posterior cruciate ligament resisting the movement, had torn off the portion of the border of the tibial upper plane into which it is solidly inserted. The spines of the upper tibial plateau remained intact as proved by the absence of hemarthrosis, and the point at which the fracture occurred was undoubtedly extrasynovial.

It is interesting to note that, from the beginning, the various authors who have discussed the subject have called attention to the fact that the line of fracture follows exactly the direction of the bone trabeculae which reinforce the epiphysis. In lateral projection the trabeculae reinforcing the upper epiphysis of the tibia form two arches which intersect one another from the front toward the back and *vice versa*. In the present case, the line of fracture cuts diagonally through the trabeculae of both arches.

Another interesting point is the absence of the articular symptoms that might have been expected from the fracture. This was probably caused by the retention of the correct position of the fragment in its lower part, which was the result of the fibrous expansions of the cruciate ligament.

RICHARD KEMEL, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Zeebényi, G. Anesthesia of the Femoral Nerve in Operations for Varicose Veins (Ueber die Betäubung des N. femoralis bei Varix-Operationen) *Orientipuls* 1930, 10 93

There is no valuable reference in the literature to the anatomical relations of the field of operation to varicose veins and the sensory distribution of very easily accessible nerve trunk. In most cases varicose vein operations are limited to a resection of the trunk of the great saphenous vein and its accessory branches. The dilated branches of the small saphenous vein are seldom resected and even more rarely the veins of the lateral surface of the thigh and leg. Consequently if we consider interruption of the great saphenous vein as the common type of operation the following considerations are of certain value.

General anesthesia is unnecessary for incision of the skin and ligation of a superficial vein. Spinal anesthesia eliminates the great advantage of conduction anesthesia with regard to complications and sequelae. Anesthesia of 6 nerve trunks, if done on both sides, means a search for nerve roots lengthily detailed procedure. On the other hand, anesthesia of the femoral nerve may be accomplished by single maneuver and is technically simple procedure which is reliable and produces superficial anesthesia in the exact area of incision for varicose vein operation. Then it is only necessary to anesthetize the area around the femoral vein by subcutaneous infiltration.

The author obtained transient anesthesia of some degree with the Laeven technique in more than 100 cases and concluded that it is invariably necessary to search directly for the nerve with the needle. The deposition of novocaine specified by Laeven reaches to a certain part of the musculature but is without effect. On the other hand, if the needle is made to touch the nerve as evidenced by the resultant paresthesia, only a few cubic centimeters of the solution are necessary to obtain complete anesthesia.

The author's technique for more extensive anesthesia is modified from his experience in the following manner.

The femoral pulse is palpated with the second and third fingers of the left hand in such a manner that the upper finger comes in contact with the inguinal ligament. The needle puncture is made one half cm. lateral to the nail of the lower finger. A heel is not necessary. If the fingers are pressed deeply and firmly one can infiltrate between the nerve and the artery while protecting the latter from needle puncture. If the nerve is not found on the first attempt, the needle should be withdrawn and again introduced about 3 cm. lateral to this point and per-

pendicular to the artery. If the nerve is still not located it will then invariably be found in the midline between these two points. All variations of the nerve fall in this fork. It is important to hold the needle in a vertical position.

In the course of this procedure the femoral nerve is anesthetized first with from 4 to 5 ccm. of 2 per cent adrenalin solution, the anesthetic standing on the opposite side of the extremity to be operated upon. Anesthesia is complete in about ten minutes. During this time the area around the femoral vein is anesthetized by infiltration with 1 per cent solution. Before the operation, the anesthesia of the operative field should be tested by needle pricks.

It is characteristic of the reliability of this type of anesthesia that the entire area between the borders of the anesthesia can be operated upon. There are no unanesthetized islands. The anesthesia extends distally to the internal malleolus and lasts from three to four hours. Troublesome complications and sequelae have not been observed.

In summarizing, conduction anesthesia of the femoral nerve is technically simple and reliable in its effect. The area of anesthesia corresponds in size and shape to the angular network of the saphenous vein.

(E. Liska) EDWARD W. GRANT, M.D.

BLOOD TRANSFUSION

Phan, H. C., and Frazer, C. V. Lesions of an Erythema Multiforme Type. *Chicago M.J.* 1929, 37 30

The authors note that in all of the cases of transfusion syphilis reported in the literature up to 1914 the donors had not been given either serological test for syphilis or physical examination. Syphilis can be transmitted from the blood of donors who are in the prechancre period of the disease. Under this circumstance there is neither physical nor serological evidence of infection, and, thus, no way to detect the presence of the disease at the time that the transfusion is given.

Ten cases of transfusion syphilis are reported, in both of which the infection was contracted from the blood of a donor who was in the primary incubation period of the disease. At the time of both donations there was neither physical nor serological evidence of syphilis in the donor.

The occurrence of widespread lesions of the skeletal system in both recipients was noteworthy. In one recipient the lesions took the form of an acute destructive osteomyelitis with multiple foci in the long bones of the extremities and the flat bones of the skull. The second recipient developed multiple periosteal lesions and papular cutaneous eruptions like that of erythema multiforme. The influence of the size of the inoculum and the route of infection on the virulence of the disease is discussed.

In discussing the procedure for the prevention of infection of this nature, the authors conclude that the only protection against unfortunate accidents such as this is constant vigilance and the critical application of the common methods of physical and laboratory diagnosis. In instances where these fail to detect the presence of infection, as in the 2 cases reported, the disease transmitted to the recipient will have to be dealt with directly, as the circumstances may require. Fortunately, such cases are extremely rare.

HERBERT F. THURSTON, M.D.

Wiener, A. S., and Peters, H. R. Hemolytic Reactions Following Transfusions of Blood of the Homologous Group, with 2 Cases in Which the Same Agglutinin Was Responsible. *Ann Int Med*, 1940, 13: 2306.

The authors note that hemolytic reactions have recently been encountered following transfusions in which the patient and donor belonged to the same blood group. Evidently such cases are rare, since only about a dozen definitely established instances have been reported in the literature to date. The hemolytic transfusion reactions belonging to this last category, namely, those due to "intragroup" incompatibility, are the subject of this report. Three cases are reported in which repeated transfusions of blood of the proper group gave rise to hemolytic reactions, the reactions resulting in the death of 2 patients.

In 2 cases there was noted the appearance in the patient's serum of an iso agglutinin designated as anti Rh. This is explained as the immune response to the injection of Rh+ blood into Rh- individuals, the blood group playing no rôle. Following the appearance of the anti-Rh agglutinins the transfusion of Rh+ blood gave rise to hemolytic reactions. Remarkably, the reactions of the anti Rh sera corresponded with those of immune rabbit sera prepared by Landsteiner and Wiener, by the injection of rhesus blood. The frequency distribution of agglutinin Rh in the general population is approximately 85 per cent Rh+ and fifteen per cent Rh-.

Methods are suggested for the prevention of the occurrence of intragroup hemolytic reactions. The danger of intragroup hemolytic reactions has been shown to be greatest in patients receiving repeated blood transfusions and in post partum cases. With regard to the warning not to use the same donor for patients receiving repeated transfusions, our findings show that this measure is not sufficient to exclude transfusion reactions, since the antigens responsible may occur in a considerable percentage of individuals. A technique of cross matching is advised to be used in addition to the usual grouping and cross matching tests, as it will anticipate most reactions of the intragroup type. Moreover, in patients receiving repeated transfusions and in post-partum cases, the serological test should be supplemented by a biological test, if time permits. In citrate transfusions it is a simple matter to inject the first 50 or 100 c cm. of blood very slowly in order to determine whether a reaction will occur. If a chill

results, the infusion should be stopped and another donor tried. This procedure would probably prevent any serious consequences since 100 c cm. of incompatible blood are hardly enough to cause a fatal reaction. In a series of 15 hemolytic reactions with 10 fatalities analyzed by Bordley, all patients receiving less than 350 c cm. of blood recovered.

HERBERT F. THURSTON, M.D.

Sassi, R. The Utilization of Placental Blood for Transfusion (Sulla utlizzazione del sangue placentare a scopo transfusionale). *Ginecologia*, Torino, 1940, 6: 205.

The placental blood is collected in a flask under sterile precautions by means of the insertion of a needle or sharpened pipette into the umbilical cord. It is mixed with a sodium-citrate solution or one of the commercial anti-coagulants and refrigerated until used. Daily bacteriological studies are made and blood more than ten days old is not used. From 50 to 200 c cm. are obtained from one placenta.

The author believes that such placental blood has special erythropoietic actions and a hormonal and immunological content superior to that of adult blood. He has given 74 transfusions to 21 patients, 6 of whom had primary dyscrasias and 15 secondary anemias. Repeated small transfusions were used and he believes that there was a definite hematopoietic response in 16 patients. Some reactions were observed, but none were particularly severe.

FRANK McDOWELL, M.D.

Stewart, C. P. Studies on Stored Blood. Results in a Series of 427 Transfusions. *Edinburgh M J*, 1940, 47: 441.

The author stresses the fact that transfusion with stored blood is still sufficiently novel to justify publication of the results obtained in a series of such transfusions. He brings out in the article the fact that a clinical trial is essential, and that it is extremely difficult to change the relative values of fresh and stored blood when, as in many cases, the results depend upon impressions. Direct comparisons are not possible.

Since September, 1939, he has received reports of 427 transfusions with blood which has been stored for periods ranging from an hour or two to as long as three days. A series of charts giving the length of storage time and the type and total of reactions is shown, and the following conclusions are made.

Storage of blood for not more than fourteen days does not increase the reaction incidence, and there is some evidence that with blood stored for from five to ten days the incidence may be reduced. On the whole it is safer to regard fourteen days as the limit of storage although evidence from a recent series of transfusions suggests that in an emergency it would be justifiable to use older blood for cases of severe acute hemorrhage.

In a series of 427 transfusions with blood up to thirty days in storage, there were 58 reactions of all kinds (13.6 per cent), and of these from 8 to 2 per

cent were classed as medium or severe. In 59 of these transfusions done since July 1, 1940 there were 27 reactions (10.4 per cent) of which 6 per cent were medium or severe. In the whole series, blood of more than fourteen days old (299 cases) gave total reaction incidence of 2.3 per cent and a medium or severe reaction incidence of 7.3 per cent.

Blood which has been stored should not be used indiscriminately. Certain cases should receive blood not more than two days old since by that time a considerable proportion of the labile leucocytes has disappeared. In these cases, in which the object of transfusion is to increase the defense mechanism, the necessity for providing leucocytes out-weighs the lessened reaction incidence obtainable with blood stored for five to ten days. Older blood seems to be suitable when the object of the transfusion is to supply fluid and oxygen-carrying power. Reliable estimates of the therapeutic value of stored blood are however difficult to obtain.

It seems possible to obtain the advantages of blood stores with good therapeutic effects in all types of cases, only if blood is withdrawn so frequently that almost fresh blood is always available. Many of the cases requiring fresh blood are not emergencies, and for them transfusions can usually be arranged on the day when blood is being withdrawn for the store. In this way practically direct transfusions can be given while use is being made of the services of the trained personnel of the store and the inconvenience to donors is minimized. P. R. McWILL, M.D.

DeGowin, E. L., and Hardin, R. C. Reactions from Transfusion of Preserved Blood. Experience with 1,400 Transfusions. *Br J M J* 1940.

Data have been presented on the incidence and types of reaction occurring in series of 1,155 transfusions of blood stored from one to thirty-eight days, and 46 transfusions of fresh blood. A types of reaction were encountered that are distinctive of preserved blood. The incidence of various types of reaction did not increase or decrease with the period of storage of the blood mixtures. A limit of ten days of storage (3 to 5 C.) was found to be safe for citrated blood. Blood stored in the dextrose-citrate mixture described was found to be safe for transfusion after thirty days of storage.

A comparison of the incidence of pyrogenic reactions in series of 95 blood transfusions with that in series of 78 parenteral injections of saline or dextrose showed that about 3 per cent of the febrile reactions from the blood transfusions could not be attributed to pyrogens in the apparatus or fluids used. This comparison did not exclude the possibility of the introduction of pyrogenic organisms at the time of the collection of the blood. The presence of pyrogens could be suspected when the incidence of febrile reactions is high.

The occurrence of fever which persists for three or four hours and usually is preceded by chill is the

most common type of reaction from blood transfusion. By alteration of the technique in the preparation of materials, the incidence of pyrogenic reactions fell to 0.2 per cent. The incidence of chills and fever in blood transfusions, however, has continued to be about 3 per cent. This could be due to (1) some peculiarity in the blood itself (2) the introduction at the time of collection of the blood of organisms which live for a few hours, produce pyrogens, and are then killed by the normal bactericidal agents of the blood and (3) the contamination of the sodium citrate with pyrogens. The first two possibilities seem the more likely.

There were deaths from transfusions, from incompatible blood and from cardiac embarrassment. Neither of these could be attributed to the use of preserved blood in contrast to transfusion of fresh blood.

HARBERT F. TARRANT, M.D.

Bécart, A., and Philippe, B. Preserved Plasma Containing Sulfanilamide. Its Advantages in Emergency Transfusion in the Absence of Donor. (*Le plasma humain sulfamidé. Ses avantages dans la transfusion d'urgence en l'absence d'un donneur de sang frais*) *Presse méd. Par* 1940, 48, 533.

The authors emphasize the therapeutic importance of emergency transfusion in traumatic shock and hemorrhage. Whereas in such conditions fresh blood from a readily available donor is desirable in war practice this is not possible because of the difficulty of maintaining a sufficient number of catalogued donors. For this reason it is necessary to substitute some other method, such as the use of preserved blood.

Certain features of preserved blood are described. Morphological changes in the red blood cells begin often within seven hours and in from twenty-four to forty-eight hours the erythrocytes appear crenated, slightly vacuolated, unequally colored, and irregular in contour. There is also some fragmentation as well as microscopic agglutination and diffusion of hemoglobin. Levels of the polymorphonuclear leucocytes occurs rapidly and their number diminishes 50 per cent in the first forty-eight hours. The complement and bactericidal power of the serum remain well preserved, whereas the phagocytic activity disappears in seventy-four hours. The oxygen-carrying capacity diminishes slightly but the lactic acid and phosphorus levels increase. There is a rapid and marked diffusion of potassium. The authors reemphasize that these alterations in preserved blood make its use undesirable after one or three days. On the other hand, preserved plasma is free from these alterations and yet serves the same purpose in the treatment of shock.

The authors briefly describe the method of preparation of plasma. The blood is citrated to 4 per cent and at the end of seven hours the supernatant plasma is poured off. It is either poured by second decantation at the end of five hours following which time it is placed in ampoules. The remaining sediment is slowly centrifuged for one

hour and its plasma content also obtained. The authors direct attention to the fact that this plasma contains a high content of platelets and that this may be of hematopoietic significance to the donor. In addition to being free from the disadvantages of preserved whole blood, preserved plasma has the advantage of not requiring grouping. Moreover, refrigeration is unnecessary and the plasma may be kept for long periods.

The authors then briefly review the use of sulfanilamide in preserved plasma and its advantages in increasing the bactericidal power and nullifying the possibility of contamination. The sulfanilamide content should be from 0.3 to 0.4 per cent.

MICHAEL DEBAKEY, M.D.

LYMPH GLANDS AND LYMPHATIC VESSELS

Nordin, G. Schaumann's Disease (Benign Lymphogranulomatosis) with Plaques of Erythroderma and Iridocyclitis as the Dominant Clinical Symptoms (Maladie de Schaumann (lymphogranulomatose bénigne) avec plaques érythrodermiques et iridocyclite comme symptômes cliniques dominants). *Acta med Scand*, 1940 104 131

Nordin reports a case of Schaumann's disease, or benign lymphogranulomatosis. This disease may cause few clinical symptoms, although the lesions are widespread throughout the organism in the deeper organs and tissues. In the case reported, the patient was a woman twenty-six years of age, four months after the birth of her child she showed signs of nephritis, albumin had been present in the urine in the latter part of pregnancy, but had disappeared after delivery. The nephritis was soon relieved under hospital treatment. Roentgenological examination of the lungs, because of some expectoration, showed numerous dark areas, connected by radiating shadows. Tubercle bacilli were never found in the sputum, and the tuberculin test was negative. Later expectoration ceased, and the lungs cleared somewhat, but several of the dark spots remained. Subsequently the patient developed iridocyclitis, first in the right, then in the left eye. Still later the cutaneous lesions developed on the legs, especially on the anterior surface. They consisted of clearly outlined red spots with little or no infiltration and very slight desquamation, they caused no discomfort. They eventually disappeared almost completely. Roentgenological study of the bones of the hands and feet showed nothing abnormal.

Histological examination of one of the cutaneous lesions showed that it conformed exactly to the description given by Schaumann of the lesions of benign lymphogranulomatosis. The characteristic epithelioid cell groups did not form large masses, but were small, collecting around the hair follicles and the sweat and sebaceous glands. Only relatively few cases with such cutaneous lesions have been described, and some of these have not been recognized as being typical of Schaumann's disease, they are sometimes described as "lupoid" or "saroid."

The pulmonary lesions in this case are the same as those described by Schaumann. The iridocyclitis in this case was characterized by increase in the intraocular pressure and the development of minute lupoid nodules especially on the border of the iris, associated with a tendency toward synechiae and punctate keratitis. Similar lesions have been described in other cases of Schaumann's disease.

ALICE M. MEYERS

Sugarbaker, E. D., and Craver, L. F. Lymphosarcoma. A Study of 196 Cases with Biopsy. *J. Am. Med. Ass.*, 1940, 115 17

Lymphosarcoma is a malignant neoplastic disease of lymphoid tissue capable of arising in any lymphoid aggregate. It may run an acute or chronic course and is almost invariably very radiosensitive. An apparent cure is possible, but the disease is much more likely to terminate in death, at which time the wide extent of clinically unsuspected metastases may be astonishing. The term "lymphoblastoma" has gained considerable popularity as a means of rather loosely conjoining a number of conditions of which lymphosarcoma and Hodgkin's disease make up the majority. By implying a common genesis of the two diseases, for which there is no justified foundation, the term has brought about a merging of the two conditions, in which the distinctive features of each have been lost.

The authors present a study of lymphosarcoma, based on a series of 196 cases, in each of which the diagnosis was confirmed by biopsy.

The frequency with which chronic infections are noted, particularly long-standing inflammatory processes in the upper respiratory system, in patients whose first evidence of lymphosarcoma appears as a nodal swelling in the neck, is rather striking. Actually 32 per cent of the patients whose first symptom of lymphosarcoma was cervical adenopathy complained of some definite chronic infection of the upper respiratory tract. The rôle of tuberculosis, however, is much less evident in lymphosarcoma than it is in Hodgkin's disease. It is not inconceivable that prolonged stimulation of the lymph nodes may eventuate in malignant cellular activity.

Males are more frequently affected than females in the ratio of about 7:3 (1:1 in Hodgkin's disease). The average ages of the two sexes at the time of admission to the hospital were approximately the same, 45 and 45.3 years, respectively, about ten years higher than in Hodgkin's disease and somewhat lower than for the commoner types of cancer. In general, lymphosarcoma is rare before the age of twenty years and after the age of seventy years. The youngest patient was four years old and the oldest eighty-eight and one of the authors has seen a proved case in a woman aged one hundred and seven.

Visible and palpable external glandular swelling constituted the first evidence of disease in 65 per cent of the patients. The enlargement was in almost

all cases entirely painless. Symptoms referable to the abdomen occurred in 75 per cent of the cases, and in two-thirds of these the main complaint was pain of varying degree usually little more than vague discomfort but occasionally it was sharp and colicky, it was due presumably to interference with bowel function. Partial or complete intestinal obstruction indefinite gastric complaints, melena, ascites and dragging sensation in the abdomen make up the remainder of the symptoms. In 1.6 per cent of the cases difficulties of the upper respiratory tract were complained of first. Thoracic symptoms were first to appear in only 3.6 per cent (pain, dyspnea, cough, and upper mediastinal syndrome). Bone pain occurred initially in .83 per cent. Systemic symptoms (chill, fever, lassitude, increased sweating, night sweats) are conspicuously absent in early lymphosarcoma and they rarely appear until the disease has reached a stage which is quite far advanced.

Two-thirds of the entire series of patients never had what could reasonably be supposed to represent an extranodal primary focus. In 59 per cent of the cases the first node involvement occurred in the neck, the axilla was first involved in .4 per cent, the groins in .9 per cent, the abdominal nodes in 1.3 per cent, the mediastinum in .1 per cent, and the epitrochlear nodes in .5 per cent.

In general, lymphosarcoma is an acutely malignant disease. Chronic forms do occur but constitute a small minority. In no other disease is metastasis apt to be so sudden and widespread. Hardly an organ or tissue is spared. The spleen was pal-

pable in 2 per cent of the cases but unless myelophthisic leukemia became superimposed, it was rarely greatly enlarged. Liver involvement as evidenced by palpably enlarged organ was noted in only .8 per cent. There was roentgenographic evidence of pleuropulmonary infiltration in .3 per cent of the cases as manifested by lung mottling or pleural effusion. A ray evidence of secondary bone involvement was present in 9 per cent. Undoubtedly this figure is too low.

There is no specific hemogram in lymphosarcoma. In contradistinction to patients with Hodgkin's disease in whom anemia usually develops early, patients with lymphosarcoma maintain excellent hemoglobin values for some time. As result of advancing disease combined with radiation therapy very definite blood-cell changes took place as indicated by counts taken from six months to several days before death. The most important of these changes was anemia.

Experience in clinical observation of the lymphomas teaches caution in attempting differential diagnosis except by an excisional biopsy interpreted by a skilled pathologist. There are no clinical features which will permit without exception differentiation between tuberculous lymphadenitis, Hodgkin's disease, lymphosarcoma, aleukemic lymphatic leukemia, lymphoepithelioma, or even metastatic carcinoma in lymph nodes. The application of a therapeutic test dose of radiation is of little diagnostic value as any of the first mentioned conditions may respond as readily as does lymphosarcoma.

JOSEPH E. NABAS, M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE, POSTOPERATIVE TREATMENT

Slevers, R. The Diagnosis and Indications in the Surgery of Children for the Practicing Physician (Zur Diagnostik und Anzeigestellung in der Chirurgie des Säuglingsalters fuer den praktischen Arzt) *Fortschr d Therap*, 1939, 15 513

Collaboration with the pediatrician is essential in the surgical treatment of children. The general anesthesia of choice is rectal avertin narcosis, this will be supplemented by chloroethyl or vinethen only rarely. Local anesthesia, when practicable, is given preference, e.g., in operations for angiodysplasia, pyloric spasm, congenital clefts about the face, and on the rectum and extremities. Extensive resort is made to Dogliotti's peridural anesthesia, which the author especially recommends, all operations below the arch of the ribs, even in the earliest periods of life, are carried out with this type of anesthesia. The author emphasizes the accuracy, safety, and long duration of this anesthesia, and also the absence of collapse of the blood pressure and the favorable influence on incarcerated hernia and atonic ileus.

Hernia of the umbilical cord should be operated upon in the first hours of postnatal life. In rare instances reposition of the hernia will be obtained with firm twisting of the cord and the application of an adhesive corset. The possibility of other malformations in the same patient is always to be kept in mind. Congenital closure of the esophagus ends fatally in almost 100 per cent of the cases, the constant gurgling sound of milk and mucus in the pharynx, refusal of feedings, and attacks of coughing and of suffocation are characteristic of this condition. Congenital intestinal occlusion is especially frequent in the duodenum, lower ileum, and colon, every case of intractable vomiting in an otherwise healthy child requires the attendance of a surgeon. The passage of meconium during the first few days of life should not be considered the final criterion.

Atresia ani and recti are discussed, intestinal occlusion with fistula into the vagina or vestibulum in the female, or into the bladder or urethra in the male, is recognized from the absence of the anal cavity, despite the discharge of meconium. These patients, also, sooner or later require the services of a surgeon. Congenital occlusion of the male urethra is rare, absence of urination quickly reveals this condition. It is a simple matter to rectify membranous closure of the external urethral meatus, however, it is difficult to treat the obstructions in the internal urinary tract, valve formations, stenoses, and tumors may be the causative factors, and as a rule they require surgical interference. The Tolmatschew semilunar valve provides a valvular closure which may be overcome by the catheter.

According to Schiff, in 4 per cent of children the normal discharge of urine sets in only after the fourth day.

In birth injuries correction of displacements is successful only within the first five days, since these fractures heal rapidly. Most frequent are the fractures of the clavicle. Birth fractures of the shaft of the upper arm and the upper end of the humerus demand careful treatment, only in the subperiosteal fracture is a splint and bandaging to the trunk sufficient. Luxation of the shoulder does not occur and a distortion should not be assumed in the presence of marked local symptoms. Of importance is the birth palsy of the plexus brachialis, it is recognized by the flaccid paralysis, and splinting is required in order that contracted posture is prevented. Fractures of the femur are frequently not recognized early enough.

In myelomeningocele an accompanying hydrocephalus, paralyzes, deformities of the legs, and incontinence of the bladder and intestines are to be regarded as contraindications to operation. Encephalocele is frequently sooner or later operated upon successfully. Harelip is operated upon in the second month. The treatment of umbilical and inguinal hernias is surgical from the seventh month on, unless incarceration should force matters sooner. Cryptorchidism and extrophy of the bladder come to operation later, the latter not till the fourth year, according to Coffey. Hypospadias is operated upon in infancy only in cases of stenosis or distortion of the penis. Children with pseudohermaphroditism are brought up as girls and are operated upon only at the onset of the secondary sexual characteristics. Too much operating is done for phimosis, only hindrance to the urinary stream justifies such a procedure. Hemangiomas should be operated upon as early as possible.

The position which the author takes with reference to pylorospasm, appendicitis, and invagination is explained.

Osteomyelitis is particularly frequent in the nursing and has a mortality of from 34 to 40 per cent. The non-fatal cases, upon early abscess and rupture to the outside, have a better prognosis than those of older children, the rupture of abscessed processes out of the joints also is in many instances comparatively benign and, especially in cases of the hip joint, is not recognized, until months later when complete luxation occurs. Puncture of the abscess and incision and immobilization of the part suffice. Cranial and jaw osteomyelitis should have special consideration in the infant, the former must be attacked surgically at an early period in order to forestall meningitis, in the latter condition it is found to be enough to incise the abscess from the inside of the mouth.

(HUBMANN) JOHN W. BRENNAN, M.D.

Robbins, B. H. Pre-Anesthetic Medication. *Arch Surg* 94:3, 40 348

The use of non volatile chemical agents, such as morphine or other opium derivations, barbiturates, or avertin with amyl en hydrat t produce depression of the central nervous system in patients before the induction of anesthesia is based on sound principles. However the type and amount of pre-anesthetic agent should be carefully selected and varied with the individual characteristics of the patient and the potency of the anesthetic agent t be employed. If the maximum effect of these agents is desired t the time of induction they must be given at the proper time.

Doses of from 8 to 6 mgm. of morphine sulfate are generally adequate if given subcutaneously from thirty t ninety minutes or intravenously thirty minutes before induction of general anesthesia. If barbiturat is t be used t place of morphine the amount and time of administration depends on the characteristics of the barbiturat which is t be used. Barbiturates are inferior to morphine because they do not produce appreciable analgesia in the patient, but, contrast to morphine these agents have certain desired effects on the autonomic nervous system. Avertin with amyl en hydrate should not be considered pre-anesthetic agent in the usual sense because of the large amount generally used.

Atropine and scopolamine exert inhibitory actions on portions of the craniosacral (parasympathetic) division of the autonomic nervous system. The usual small dose affects mainly that portion of the parasympathetic system which regulates the secretion of the salivary glands and the mucous glands in the mucosa of the oral and respiratory tracts. If the general anesthetic to be used does not cause an increase in salivary or mucous secretion these drugs are of little value. Experimental evidence indicates that the most is of atropine t scopolamine both are usually employed as pre-anesthetic medication have little or no effect on the cardiac branches of the vagus nerves.

When spinal, paravertebral, or local anesthesia is t be used, preliminary dose of morphine or of barbiturat gives the patient mental or psychic relief. A marked fall of the blood pressure is frequently associated with spinal anesthesia or paravertebral block and is due to paralysis of the sympathetic nerves with subsequent pooling of the blood in the arterioles and capillaries. This effect may be counteracted by injection of one of the longer acting sympathomimetic amines such as ephedrine, fifteen minutes before the beginning of anesthesia. Pre-medication with barbiturates protects against the cardiac irregularities produced by ephedrine and also may be of value in preventing the toxic manifestation due to absorption of local anesthetics.

The author discusses the subject of noxious relation t pre-anesthetic sedation. Large doses of morphine, barbiturates, or avertin with amyl en hydrat may produce anoxic anoxia by depression of the respiration. Experimental evidence obtained

with dogs indicates that anemic anoxia may result from the pre-anesthetic use of amyl en hydrat. Anoxic anoxia as a result of spinal anesthesia may be prevented by the use of ephedrine. There is little evidence that the ordinary amounts of pre-anesthetic sedatives cause anoxia of the histotoxic type.

EDWARD W. GIBBS, M.D.

Alexander, J.: Pre-Operative and Postoperative Care of Patients with Surgical Diseases of the Chest. *Arch. Surg.* 94:3, 40 35.

Good results in the surgical treatment of diseases of the chest are dependent upon accurate diagnosis, and upon painstaking and careful attention to details before, during, and after operation.

Repeated and serial roentgenograms are essential t careful diagnosis and to the guidance of therapeutic and operative procedures. Bronchoscopy is essential t thoracic diagnosis, and t pre-operative and postoperative therapy in many instances.

Patients with chronic pulmonary disease are poor surgical risks and adequate pre-operative preparation is essential.

Expert anesthesia is extremely important. The author thinks cyclopropane is probably the best of inhalation anesthetics for thoracic surgery.

Postoperative management few things are particularly important.

The adequate administration of fluids, 1, 3,000 ccm daily.

2. The administration of oxygen routinely after lobectomy and pneumonectomy and in all other patients with slight cyanosis or dyspnea, or evidence of shock.

3. The prevention of paradoxical motion of the chest wall, which, when pronounced, leads to paradoxical motion of the mediastinum, and results in decreased circulation and anoxemia. These in turn increase dyspnea which increases the paradoxical motion, and a vicious cycle is established. Labored breathing, cyanosis, lowered blood pressure and rapid pulse are found, and a state of "thoracic shock" exists. To combat this, as effort should be made to steady the thoracic wall with elastic compressive dressing; the patient should be on the operative side, and stimulants and oxygen should be administered.

4. The aspiration of fluid and/or air in cases of pyothorax or pneumothorax after thoracoplasty is important in order t prevent the development of increased intrapleural pressure with its attendant dangers.

5. Drainage of the pleural cavity after lobectomy and pneumonectomy for infectious diseases careful control of the intrapleural pressure is necessary and is obtained by some type of siphon apparatus attached t a ter-sealed bottle.

6. The evacuation of pulmonary secretions is most important. The cough reflex must not be abolished by the giving of large amounts of opiates; patients must be made to cough. Bronchoscopic aspiration of retained secretions may save patients in crisis.

7 Abdominal distention increases dyspnea, it may be due to acute gastric dilatation

8 Emphysema of the chest wall is not serious unless it is due to a tension pneumothorax, which is best relieved with a needle fixed between the ribs and attached to a rubber tube, the distal end being kept under water, or by actual suction through a catheter between the ribs

9 Wound infection calls for wide opening of all the layers of the wound

There are many practical points discussed in this paper and any surgeon interested in thoracic surgery should study this article in detail

JULIAN A. MOORE, M D

Walters, W, and Hartman, H R Pre-Operative and Postoperative Care of Patients with Lesions of the Stomach and of the Duodenum *Arch Surg*, 1940, 40 1063

Compensation for the toxemia of dehydration with alkalosis, hypochloremia, and loss of sodium by the intravenous administration of solutions of sodium chloride with and without glucose has been a routine procedure in the pre operative preparation of patients who have gastric or duodenal obstruction with which gastric retention of more than 300 c cm is found to be associated. The need for treatment depends not on the amount of gastric retention present when the study is made but on the alteration of the blood chemistry coincidental with the obstruction. The toxic state is determined by the degree of persistence of the obstruction. Intermittent obstruction, even complete obstruction intermittently, is not likely to permit a severe toxic avitaminosis or state of nutritional deficiency to develop. The administration of too much sodium chloride manifests itself by an elevation of the blood chlorides beyond normal values and, occasionally, by the development of edema of the ankles and hands. We prefer to administer the intravenous solutions by intermittent injection rather than continuously, as the latter method becomes tiresome to the patient and may produce thrombosis of the vein.

When the degree of obstruction is severe the fluidity of the diet should be increased. The liquid diet administered should be palatable and should contain sufficient vitamins, if it does not, Vitamin B and Vitamin C should be given. Vitamin K should be given if the prothrombin time is increased or if there is evidence of hepatic insufficiency which, under the strain of prolonged operation, may be responsible for inadequate maintenance of the normal coagulability of the blood.

A determination of the concentration of blood urea and blood chlorides, carbon dioxide-combining power, and serum proteins at the start of the period of preparation with repetition of the studies after a period of two or three days will serve as an indicator of whether the toxemia due to dehydration has been controlled. One or more transfusions will be required prior to operation if anemia is extreme. The patient with an acute perforation of a duodenal

ulcer usually requires an immediate surgical procedure, a part of which at least is closure of the perforation. In such cases, it is advantageous to empty the stomach with a stomach tube before performance of the operation, this is particularly advisable if the patient is to have a general anesthetic.

The postoperative care of the patient may be considered from the standpoint of routine measures to be instituted in cases in which no complication exists and from the standpoint of treatment of postoperative complications. General measures of importance are maintenance of a positive fluid balance to the extent that intake exceeds output or that there is a positive fluid balance of at least 1,000 c cm every twenty-four hours, or better still, from 1,500 to 1,800 c cm. It is important to observe the urinary output and its specific gravity each day, for a low urinary output may mean insufficient fluid intake or urinary retention. If gastric retention is present in amounts of not more than from 800 to 1,000 c cm during a twenty-four-hour period, intermittent emptying of the stomach by aspiration may satisfactorily tide the patient over the period of retention.

Pulmonary complications subsequent to operation usually consist of atelectasis, bronchopneumonia, or pulmonary embolism. Although it may be believed that atelectasis occurs more frequently after general anesthesia, experience has shown that it occurs probably with as great a frequency following the use of spinal anesthesia. The patient who has atelectasis should be placed immediately on the side corresponding to the undisturbed lung and should be changed frequently from his back to this position, in the hope that in this fashion, and by encouraging him to cough, the plug of mucus that obstructs the bronchus will be dislodged. Placing a hand on each side of the patient's thorax and compressing it when he starts to cough is very helpful to the patient in expelling mucus from the bronchi. Inhalations of carbon dioxide and oxygen (95 per cent oxygen and 5 per cent carbon dioxide) after a short time at frequent intervals increase the depth of expiratory excursion and will assist, first, in dislodging a plug of mucus and, second, in inflating the collapsed portion of the lung. Oxygen is particularly valuable in these cases as it decreases the respiratory rate and helps the patient to expel the bronchial mucus.

Clinical experience has proved that when the diagnosis of bronchopneumonia is suspected from the increased temperature and pulse rate, even in the absence of positive thoracic or roentgenological findings, the patient does better if immediately placed in the oxygen tent. As signs of the bronchopneumonia can be elicited on physical examination and demonstrated by roentgenological examination and if the patient's condition warrants, chemotherapy should be started without delay. With sulfanilamide it was our custom to give an initial dose of 75 gr (5 gm) in the first twenty-four hours, following it by doses of from 40 to 60 gr (2.6 to 4 gm) on each succeeding twenty-four hours for a period

of five or six days. At no time should the concentration of sulfanilamide in the blood be allowed to exceed 15 mgm. per 100 c.c.m. With the introduction of sulfapyridine Moersch and Minshaw have advocated the administration of from 60 to 90 gr. (4 to 6 gm.) of sulfapyridine in the first four hours, then 15 gr. (1 gm.) every four hours for a period of five or six days. If it is necessary to institute chemotherapy the first forty-eight hours subsequent to operation when the patient is not taking fluids orally, the sodium salt of sulfapyridine is given intravenously—0.06 gm. per kgm. of body weight is given and repeated every six to eight hours. Estimations of the concentration of these substances in the blood are made at frequent intervals to prevent overdosage. Reexaminations of the blood should be made to eliminate too great a drop in the number of leukocytes, and repeated examinations of the thorax particularly roentgenologically, are made to ascertain whether fluid has developed in the pleural cavity or if empyema is present. In our experience, such complications are extremely rare.

Various methods of reducing the incidence of fatal pulmonary embolism have been attempted or carried out, among which are the standardized frequent moving of the patient from side to side, elevation of the foot of the bed, the administration of thyroid extract and more recently the intravenous use of purified heparin. Although in large series of cases these various methods have been used to decrease postoperative fatal embolism (all of which methods have value) the fact remains that fatal pulmonary embolism continues to occur fortuitously, it occurs infrequently and is, it would seem, one of the few remaining unsolved problems pertaining to the treatment of postoperative complications.

In many cases in which pyloric obstruction prevents a proper intake of nourishment and fluids prior to operation and the patient is in a state of malnutrition, a catheter is introduced into the stomach through the nose or mouth is carried through the stomach to the anastomosis at the time that the anastomosis is made and is placed in the distal loop of the jejunum or in the duodenum. If an operation of the Billroth I type is performed, so that feedings can be begun immediately subsequent to operation. This is of particular value in cases of long-standing pyloric obstruction in which partial gastric atony has occurred and efficient emptying of the stomach is delayed postoperatively. We have been using formula which has composition of 5 gm. of carbohydrates, 4 gm. of protein and 4 gm. of fat. Most mixtures of ice cream contain constituents in this proportion and are made up of whole-milk powder, cream or butter fat, egg powder and gelatin. The mix is homogenized and has been more successfully employed for use in jejunostomy tube than former mixture of milk and cream which occasionally produced some diarrhea. More oral tools have resulted in cases in which the ice-cream formula has been used. The mixture is added concentrates of Vitamin K, ascorbic

acid, halibut liver oil, and thiamin chloride. The method of preparation of the formula is as follows:

Mix skimmed milk powder (1 lb) with water to make a smooth paste. Add the remainder of the water, the glucose and the ice-cream mix. Beat the eggs, add half-bt liver oil, and beat again. Combine the mixtures, strain, and add dissolved ascorbic acid and thiamin chloride. Individual feedings should be warmed in hot water to body temperature.

Palma, J. R. Pre-Operative and Postoperative Care of Patients with Lesions of the Small Intestine and of the Colon. *Arch Surg* 910, 20 031.

Surgical lesions of the small intestine and colon may be classified under three heads: (1) inflammatory lesions such as appendicitis, regional enteritis, diverticulitis, and ulcerative colitis; (2) obstructive lesions, which may be taken to include the various pathological types of obstruction, partial or complete; and (3) neoplasms not producing obstructive symptoms.

Recently much improvement has been made in pre-operative and postoperative care because of an ever increasing appreciation of the importance of deficiencies in Vitamins B and C. When Vitamin B is found to be lacking, as evidenced by pre-operative tony of the gastro-intestinal tract with its accompanying symptoms, the author drives the daily administration, orally or intramuscularly of: gr (0.65 gm.) of thiamine chloride and 50 mgm. of nicotinic acid. When Vitamin C is deficient, as determined by the quantity of ascorbic acid in the blood and urine, 50 mgm. of ascorbic acid are given daily by mouth or hypodermically.

The role of plasma proteins has recently been emphasized, especially when there is obstruction of the site of anastomosis or in the instance of eversion or poor postoperative wound healing. When the level of blood proteins falls below 7.5 gm. per 100 c.c.m. edema occurs, which may give rise to the aforementioned postoperative complications. At present the safest and most effective way to raise the level of blood proteins is by transfusion of whole blood or blood plasma.

The importance of the judicious administration of fluid both pre-operatively and postoperatively is emphasized. Determination of the blood chloride before operation, and the status of dehydration and alkalosis are of unquestionable value. As a working rule, the author has found it feasible to give fairly routinely each day postoperatively 500 cc. of physiological solution of sodium chloride in the morning and 500 c.c.m. of 5 or 10 per cent dextrose in distilled water in the afternoon or evening. Fluids administered parenterally are of importance for at least from four to six days following surgery on the gastro-intestinal tract, but care must be taken that edema from excess amounts of saline solutions be avoided. Older patients are given hypodermoclysis. Proctoclysis has fallen from favor but is of value in isolated instances.

Recent developments in the prophylactic treatment of postoperative peritonitis are reviewed. These include the vaccine developed by Bargin, colibactragen developed by Steinberg, intraperitoneal injections of sodium recinoleate (Rea), amniotic fluid, and immunotransfusions of serum. The author admits very little experience with these measures. Roentgen irradiation has been advocated in certain patients with peritonitis. Sulfanilamide is to be considered a worthwhile addition to the present inadequate means of treatment of peritonitis.

Postoperative treatment has been improved in recent years with such measures as decompression by gastroduodenal aspiration, inhalation of high oxygen concentrations, and the use of drugs, including prostigmine, physostigmine, mecholyl, pitressin, and a solution of extract from the posterior lobe of the pituitary gland. However, such drugs should find little place in the postoperative phase of surgical therapy of the intestine if appropriate measures are taken to prevent the development of distention.

Morphine sulfate, $\frac{1}{6}$ gr., is given every four hours as needed postoperatively for about forty-eight hours. Tracheal aspiration during the immediate postoperative period is of major significance in allaying pulmonary complications. The Trendelenburg position after a prolonged, deep anesthetic assures good drainage of the bronchial secretions, and aids in the treatment of postoperative shock. Adequate blood transfusions should be given in cases of shock. Active movements should be encouraged from the beginning of the postoperative period, aided by turning of the patient every hour as soon as he is awake. Elderly patients tolerate surgical procedures better if kept in an oxygen tent for the immediate postoperative period.

HAROLD LAUFMAN, M D

Cot and Genaud. The Installation of Oxygen Therapy Supplied by Liquid Oxygen. (Installation d'oxygénothérapie collective alimentée par l'oxygène liquide) *Presse méd*, Par, 1940, 48 361

The authors have devised a method of oxygen therapy which utilizes compressed or liquid oxygen. They believe that this method with liquid oxygen will be useful in metropolitan communities, and with compressed oxygen in isolated communities. The initial cost may be somewhat high but this is balanced by the ease of replenishing the supply of oxygen with containers of compressed oxygen.

FREDERIC W ILFELD, M D

Howes, E L. A Renaissance of Suture Technique Needed. *Am J Surg*, 1940, 48 548

The use of silk as a ligature and suture material has recently gained widespread prominence. Halsted many years ago used fine silk with excellent results. These results were due not only to the use of silk, but also to the proper technique for the use of this material. The author stresses the importance of selecting the proper suture material and employing a careful technique. The following pertinent points are emphasized:

1 Suture the cut edges to obtain healing in the shortest possible time after the infliction of the wound rather than to secure them as safely as possible.

2 Sutures must not be made the agents for transplanting bacteria into the wound. Sutures pick up bacteria (a) by being soaked in a basin previously used to wash instruments coming from the wound, (b) by coming in contact with exposed skin edges, and (c) from repeated handling.

3 Sutures should not be inserted and tied in such a manner as to create necrotic tissue in which the bacteria may grow. The bite of tissue included in the suture should be about three-eighths of an inch when tied, and tied loosely. The edema that develops in the wound during the first forty-eight hours tightens the sutures further. The tightness required for skin sutures should be used as the guide for the tightness of deep sutures. The redness and infection which develop around the skin suture tied too tightly indicate the effect of the same degree of strangulation on the more easily necrotized muscle and fat. Large tufts of tissues should not be tied off by ligatures. The tuft should not be visible. Excellent wound healing results when healthy cells are placed in contact with healthy cells. Because of the danger of necrosis resulting from tension on the sutures, layers of tissues which will not lie together should not be sutured together. Rather than attempt to approximate tissues under tension by means of sutures, one should release tissues by plastic incisions, or not suture them at all.

4 Traumatic wounds seen eight hours or more after infliction should not be sutured, because bacteria have already begun to multiply.

5 Sutures should be used sparingly; they are foreign bodies and as such aid in developing a bacterial infection. The common error is to use too much suture material and, especially, too large sizes. Because of the inability of the tissues to hold larger sutures, there is no need to use a suture larger than No. 0 catgut or its equivalent size of silk. Exceptionally, a larger strand may be needed to set the knot, but not to hold the tissues.

6 In order that sutures may be used sparingly and yet have the greatest mechanical advantages, interrupted sutures should be used with triple throw knots, all tied square. Tissues having the greatest holding power for the sutures, or possessing a mechanical advantage, should be sutured—the peritoneum, the fasciæ, and the skin. The rest of the tissues do not need to be sutured, except under special circumstances. The suture should be of such a type that it pulls at right angles to the tissue fibers and not parallel to them.

7 The clean wound made to drain an infected focus, as, for example, an appendiceal abscess, should not be contaminated during operation. Laparotomy pads provide protection, and suction should be used to remove the pus. After the peritoneum is closed, the wound is treated as a traumatic wound, freshly contaminated, namely, by irrigation and débride-

ment. Subsequent drainage seeps less between the layers if the drains are placed at one end of the wound. There is no need for the defeatist attitude that all such wounds become infected and therefore the layers above the peritoneum should be left open to heal by secondary intention.

8 The skin edges should be everted by the sutures.

9. Attention to details and meticulous care in handling the tissues, instead of haste, cannot be overemphasized. The surgeon may save five or ten minutes in closing the wound rapidly, whereas the patient may lose several weeks, and his life may be endangered, in fighting infection.

MANUEL E. LORRAINE, M.D.

Perrone, J. A. Bronchoscopy as a Treatment of Postoperative Atelectasis. Report of 94 Cases. *Ann. Otol. Rhinol. & Laryngol.* 1910, 49, 318.

This author reports on 90 cases of atelectasis which occurred during a period of six years when about 2000 operations were performed. He states that he is amazed at the rarity with which the bronchoscopic treatment is mentioned in the literature. He believes that fear can be completely discounted as a risk if the procedure is done by a trained bronchoscopist.

Sixty-five patients were male. The youngest was seven years, the oldest eighty-five. Most commonly the condition followed operations on the upper abdomen, particularly those on the stomach and the biliary tract. Atelectasis follows any type of anesthesia, even spinal and local. Seventy-four patients had their onset between thirty-six and forty-eight hours after the operation, 3 in less than twelve hours, 3 after three days, and 1 on the sixth day.

The earliest manifestation of atelectasis of the lung is the elevation of the temperature, which in the first few hours may fluctuate between 99 and 100 degrees, and then suddenly rise to 101 or more. The characteristic respiratory symptoms observed in the order of their frequency are dyspnea, cyanosis, rapid pulse, and pain in the chest. Expansion of the chest is limited or absent over the affected area. Often the intercostal spaces are retracted. The heart and trachea may be drawn toward the affected side. There is early hyperresonance but as the secretion increases dullness is noted. At first the breath sounds are absent or diminished, but later there is tubular breathing with moist bubbling rales.

The roentgenological findings in early atelectasis reveal little or no increase in density over the lung; later the shadow may be dense and homogeneous.

As a preventive measure during the operation the use of suction for removing secretions that have collected in the pharynx, nasopharynx, and trachea cannot be overemphasized. Light narcotics should be used whenever possible in order to preserve the cough reflex. The use of carbon-dioxide induced by penthrone for use of anesthetizing on the operating table following inhalation anesthesia is of great aid, but by no means does it prevent atelectasis. The

postoperative positions of the patient in bed are important. The position for least impediment to the respiration and for greatest vital capacity is the Fowler position. The postoperative effect of drugs diminishes respiratory movement and the vital capacity and abolishes the cough reflex, which is not beneficial. Tight dressings and bandages should be avoided. Abdominal distention should be prevented.

The treatment consists of stopping all sedatives, encouraging the patient to cough, and moving him from side to side in bed. Carbon-dioxide inhalation may be given. If no improvement takes place in from eight to ten hours bronchoscopy is done and the mucus plug is removed.

Bronchoscopic aspiration results in a sudden drop of the temperature in the pulse, and in the respiratory rate. The patient almost immediately feels relieved of dyspnea and is able to cough up any secretion which has not been aspirated.

J. DANIEL WILLIAMS, M.D.

ANTISEPTIC SURGERY TREATMENT OF WOUNDS AND INFECTIONS

Charbonnier, A. Generalities in Regard to Penetrating Wounds of the Abdomen in War Surgery (*Généralités sur les plaies pénétrantes de l'abdomen en chirurgie de guerre*). *Rev. méd. de la Suisse Rom.* 1910, p. 357.

Charbonnier notes that most of the war wounded with penetrating wounds of the abdomen die either on the battle-field or during transportation to the hospital. Many of those who reach the field hospital are in a state of shock, yet shock as well as nausea and vomiting may be absent in the first few hours; severe pain may be the chief symptom. If vomiting is an early symptom, it is a definite indication of injury to an abdominal organ. Vomiting developing later indicates a beginning peritonitis. The diagnosis is evident in cases of large open wounds. However frequently the point of entry of the projectile is indicated only by a small wound, and there is no definite indication that the peritoneum or any organ has been perforated. There are two definite physical signs that indicate a visceral lesion: localized or generalized contracture and rigidity of the abdominal muscles including the diaphragm and contraction of intestinal peristalsis. If neither of these signs is present, it is practically certain that there is no lesion of the gastro-intestinal tract. Internal hemorrhage may be present, as the presence of blood does not necessarily cause irritation of the peritoneum with resulting muscular rigidity. If there is no generalized peritonitis the muscular rigidity may be localized, and this may indicate the organ that has been injured. In some cases the diagnosis does not become evident until the state of shock is relieved. If the typical symptoms of internal hemorrhage are present, immediate operation is indicated. However, if the patient is in a state of shock, operation is not indicated. If the wounded patient is seen as late as twelve hours or more after the injury

and his condition is relatively good, with no alarming symptoms, it is evident that there is no penetrating injury of the digestive tract. A change in the facies, vomiting, oliguria, weakening pulse, and abdominal rigidity with meteorism and peristaltic silence are evidence of a developing peritonitis.

When the initial state of shock has been relieved, operation is indicated in the presence of any symptom of injury to the thoracic or abdominal organs. The incision should be large enough to permit of thorough exploration, if the wound of penetration is large, it may serve as the route of access. Otherwise, a median abdominal incision is employed. The projectile, other foreign bodies, blood, and exudate (if present) are removed from the peritoneal cavity, which is then irrigated with physiological saline solution, and the lesion of the peritoneum is repaired. Then the gastro intestinal tract and abdominal organs are carefully inspected and the necessary procedures (sutures, resections, anastomoses, operations for exclusion, exteriorization, and hemostasis of the mesentery) are carried out according to the conditions found. If the spleen is injured, splenectomy may be done, but nephrectomy should be avoided unless the kidney is practically destroyed. If the thorax is injured, a supplementary thoracotomy should be done, the diaphragm sutured, and the pleura drained. There is a difference of opinion in regard to drainage of the abdominal wound in such cases, but in war surgery with the constant danger of infection from the penetrating wound, the author favors drainage. The results of treatment of penetrating wounds of the abdomen depend chiefly upon the time at which operation is done. If operation is done within twelve hours, the percentage of recoveries is double that obtained with operation between the twelfth and the twenty-fourth hours. Recovery is very rare if operation is done after twenty-four hours. ALICE M. MEYERS

Baillat, G. The Treatment of War Fractures in Occlusive Plaster Casts (*Le traitement des fractures de guerre par l'appareil plâtré occlusif*). *Rev d'orthop*, 1939-1940, 26: 656

Baillat notes that the treatment of war fractures by immobilization in occlusive plaster casts was used in the recent Spanish civil war, and is known as the Spanish method. When the Spanish refugees reached France, many of the wounded still wore these plaster casts, and were in very poor condition. This method of treatment, therefore, has been much criticized on the basis of the poor results observed in these cases. The method should not be judged on this basis, however, as these Spanish soldiers had not been under any medical supervision in the confusion of the retreat, and careful supervision is essential for the success of this method of treatment. In many cases the primary surgical treatment had also been insufficient and the primary treatment is another important factor in the results obtained with this method.

On the contrary, the results reported by Trueta, I. Raspall from his hospital in Barcelona have been

very satisfactory, here the primary surgical treatment and the supervision of the patients could be carried out properly. The fracture was reduced with an extension apparatus, and the plaster applied over a few layers of gauze so as to immobilize, if possible, the two nearest joints. The first plaster cast was not left in place more than from ten to fifteen days and the second, from twenty to thirty days, the third was left in place for one month. Infected tissue was not left in the fracture area, if this was done, it was necessary to open the plaster to secure drainage, and then replace the plaster. In the 615 cases treated by Trueta according to this method, amputation was necessary in only 1 case, and the functional and orthopedic results were usually satisfactory. Pseudarthrosis developed in 3 cases because of excessive loss of tissue, and stiffness of the joint resulted in a few cases, especially in the knee or elbow. There were 2 cases of complete ankylosis of a joint.

The author has used this method in the treatment of fractures in civil practice as well as in war wounds in the Spanish civil war. The results, after appropriate surgical treatment, were good in the majority of the cases. He is convinced that if this method is correctly used in suitable cases it is of definite value in the treatment of war wounds.

ALICE M. MEYERS

Legroux, R. The Prevention of Infection in War Wounds by Chemotherapy (*Chimio-prévention de l'infection bactérienne des plaies de guerre*). *Mém Acad de chir*, Par, 1940, 66: 415

In a preceding communication the author stated that (1) the infectibility of a wound depended upon the amount of culture medium created by the dead tissue present, and (2) it was difficult to envisage any therapeutic effect from antihodies injected into the general circulation, and, therefore, surgical ahalation of this tissue was the most important single therapeutic procedure. The present report, however, shows the therapeutic and preventive value of paraminophenylsulfamide (1162F) in such wounds.

It was shown during the World War that the most common fatal bacterium was the hemolytic streptococcus. The anaerobic gas forming organisms were infrequent but very lethal when they occurred. The present experiments tested both of these organisms. Rabbits were used for the streptococcus tests and guinea pigs for the anaerobic tests. Pure cultures of from twelve to fifteen hours' duration were used in the crushed adductor muscles of the animals. Rabbits infected with streptococci died from eighteen to forty-eight hours. From 0.3 to 0.6 gm of the sulfamide applied to the surface of the crushed muscle at the same time as the organisms prolonged life to three or four days. If the animals were treated by the oral route with the sulfamide from one and one-half to two days before the probable date of death they survived. The author believes that penetration of the drug into the system has a stronger anti-streptococcal effect than that obtained by local administration of the drug to the wound.

Infection of guinea pigs in the same manner with the bacillus perfringens or the bacillus histolyticus resulted in death of the controls in 1 or three days but the animals receiving sulfamide locally did not die till the fourth or seventh day. If the sulfamide was applied at varying intervals after the infection, death occurred in three or four days except in those receiving the sulfamide only one hour after infection. These lived all days. If the sulfamide was given by mouth at the same intervals after infection the animals died as quickly as the controls. This may possibly be explained by the fact that the anaerobes cause more localized processes and are less accessible to systemic medication than the streptococci. Similar experiments with the tetanus bacillus showed a slight prolongation of life but no prevention of fatal outcome in the animals treated with the sulfamide.

The author believes that sulfamide is of great value in preventing streptococcus infection, of some value in the prevention of anaerobic infection, and of no value in the prevention of tetanus.

The only ill effect of the sulfamide in several hundreds of cases of meningitis was agranulocytosis.

The author believes that sulfamide should be used locally and by mouth in all wounds. All wounded at first-aid stations should take 5 gm. of sulfamide by mouth. RICHARD WARREN, M.D.

Rouquès, L. Tetanus: Vaccination and Sero-vaccination; Course Pursued in the Wounded; Onset of Tetanus; Partial Tetanus of the Extremities; Sero-anatoxin Therapy (Le téteanos la vaccination et la séro-vaccination conduisent à tenir chez les blessés le début de téteanos et les états partiels des membres la séro-anatoxithérapie). *Presse méd. Par.* 1920, 48, 497.

In 1913 Rouquès discovered that tetanus toxin like diphtheria toxin could be transformed by the combined action of formaline and heat into a specific anatoxin toroid for vaccination against tetanus. Further investigations established that immunity against tetanus could be produced by the administration of three subcutaneous injections separated by intervals of one or several weeks.

The number of vaccinated subjects has become considerable. In May 1919, Rouquès estimated that 500,000 and more than 800,000 soldiers had been vaccinated in France. Anti tetanus vaccination has been introduced in the English army and is compulsory in both the Italian and French armies. No case of tetanus has been reported among the vaccinated individuals.

In previously vaccinated patients with wounds likely to lead to tetanus an injection of tetanus anatoxin is given, which produces considerable increase in the titer immunity. If there is some doubt regarding the previous vaccination it is safer to administer simultaneous injections of antitetanic serum and anatoxin. In wounded patients not previously vaccinated subcutaneous injections of 1 cm. of tetanus anatoxin is administered and immediately

followed by 3,000 units of tetanus antitoxin. Ten weeks later 1 c.cm. of anatoxin are injected, and ten weeks after this a third injection of 1 c.cm. of anatoxin is given.

The author draws attention to the early signs of tetanus, emphasizing particularly the exaggeration of local reflexes in the region of the wound.

Partial tetanus of the extremities is characterized by muscular and reflex hyperexcitability. It usually occurs in patients who have received serum early. The incubation period is usually long, commonly three or four weeks and occasionally 1 or three months or longer. The patient complains of pain, cramps, and stiffness in the wounded extremity. Examination reveals hypertonic firm muscles resistant to passive motion, active reflexes, and, not infrequently, clonus. The temperature is usually normal and the pulse rate may be slightly elevated. The prognosis is favorable although in some cases the disease may become generalized and lead to death.

The important considerations in the treatment are sedation and sedation. The author is of the opinion that chloroform anesthesia is best, although chloral hydrate may also be used. Serum should be given by the intramuscular and subcutaneous routes. The efficacy of intravenous and intraspinal routes is controversial. The standard administration of antitetanic serum and anatoxin should be employed as advised by Rouquès and Kourilsky. As soon as the diagnosis is made a massive dose of 50,000 units of antitetanic serum is given and one dose of 1 c.cm. of anatoxin. This is followed by increasing doses (1/4 and 1/2 cm.) of anatoxin at intervals of five or six days. The author emphasizes the importance of eradication of the primary focus and removal of all foreign bodies.

MICHAEL DEBAKEY, M.D.

Biebling, R. The Bacteriology and Serology of Gaseous Edema (Die Bakteriologie und Serologie der Gaseodemkrankungen). *Deutsche Med. woch.* 1919, 5, 50.

The toxin formation of gas bacilli is of practical interest and varies with the different bacteria, but, as far as is known, the ferment formation (collagenase, amylase, di and mononucleopolyphosphatase) is more or less common to all. The toxins formed by the Frankel bacillus include hemotoxin, cutaneous necrotic toxin, and general toxin, and those formed by the para-anthrax bacillus include hemotoxin, cutaneous necrotic toxin, heart and kidney toxins. The toxin formed by the bacillus edematis (Vern.) the edema toxin. While the bacillus histolyticus has specific toxin. A table is presented listing the mobility type of proliferation, toxins, and ferment of all gas-producing organisms.

The effect upon the blood vessels produces the edema, in which the bacteria form like schools of fish. The involved muscular tissue retains its regenerative capacity as long as the circulation is not completely obstructed. At this stage long incisions into

the muscle are still helpful. If, however, necrosis of the muscle has begun, the destructive gangrenous transformation is accelerated by the ferments. Toxinemia is favored by the absence of vascular thrombosis and by the M. Clean diffusion-favoring factor formed by the gas-bacilli themselves.

The plan of treatment is as follows

1. Earliest possible surgical toilet of the wound to remove all dead tissue

2. Early prophylaxis (within the first four hours at the nearest dressing station) with subcutaneous injection of at least 20 c cm. of gas edema serum

3. Late prophylaxis in the particularly threatened muscle wounds on the operating table by the intravenous injection or infusion of 100 c cm. of gas-edema serum under anesthesia (at the field hospital or main dressing station)

4. Treatment of manifest gas edema by repeated infusions of this type

Deep antisepsis with yuzin and the peroral administration of prontosil require further trial

(FRANZ) EDITH SCHANCHE MOORE

ANESTHESIA

Sise, L. F. *The Management of the Patient under Spinal Anesthesia*. *Surg Clin North Am*, 1940, 20: 631

The author stresses the importance of careful supervision of the patient by a competent anesthesiologist after spinal anesthesia has been administered, because of the potentially dangerous complications which may arise during the first half hour.

A slight fall in the blood pressure may be normal, but to what extent a fall may occur without detriment to the patient is questionable. The author finds that, rather than the blood pressure alone, appraisal of the general condition of the patient is the only reliable guide to his progress. A dulling of the intellect, pallor, diminished pulse volume, shallow respiration, and cool extremities suggest need for supportive treatment. The least trace of cyanosis calls for instant treatment. The most effective measures are the use of a slight Trendelenburg position, the prophylactic use of ephedrine, or a mixture of 5 units of pitressin and 25 mgm. of ephedrine given subcutaneously or intramuscularly, intravenous saline infusion, and the avoidance of such procedures as traction on the gall bladder pedicle or gastric omentum or manipulation of the liver, which cause profound alterations of the blood pressure. It has been noted that the fall in blood pressure will not be as severe if the patient is put under general anesthesia a little before the shocking portion of the procedure is started. The intravenous administration of pentothal sodium has been found suitable.

Nausea with vomiting seems to be due largely to certain surgical procedures associated with a drop in the blood pressure rather than to the anesthesia itself. When vomiting has begun, palliatives such as oxygen, cold compresses, and deep breathing will

not help and only a general anesthetic will stop it. Pentothal sodium is a good preventative before vomiting has started, and either pentothal or cyclopropane will usually terminate it. Depressed or arrested respiration may be caused either peripherally, from paralysis of the muscles of respiration, or centrally, from depression of the vital centers. It is important that the anesthesiologist keep a close watch on the amount of intercostal paralysis. As intercostal paralysis progresses upward chest motion becomes less, while abdominal motion increases. When chest paralysis becomes complete the chest is sucked inward during inspiration by the powerful action of the diaphragm. When the diaphragm becomes paralyzed, and, finally, the accessory muscles, respiratory paralysis is complete. These changes can be easily followed by the trained anesthesiologist. It is wise to administer oxygen as soon as intercostal paralysis becomes evident. If breathing becomes more seriously affected, some assistance to inspiration by gentle pressure on the breathing bag is used, and if paralysis progresses, complete artificial respiration by rhythmic bag pressure with a closed carbon-dioxide-absorption system is indicated.

Central failure of respiration is more serious, and in addition to supplying oxygen one must immediately treat the fall in blood pressure. The Trendelenburg position must be assumed, and pressor drugs administered.

Restlessness during the operation may be counteracted by a sufficient amount of preliminary medication which puts the patient in a drowsy and "don't care" attitude. Occasionally, a supplementary dose of morphine and scopolamine or barbiturate (pentothal) given intravenously, or gas anesthesia is required. It is probably wise not to exceed a dose of $\frac{1}{8}$ gr. of morphine and $\frac{1}{200}$ gr. of scopolamine, or of 1 dg. of pentothal sodium to begin with.

JOHN A. GIUS, M.D.

SURGICAL INSTRUMENTS AND APPARATUS

Sereghy, E. *The Sterilization of Solutions, Syringes, and Needles, and a New Drum for the Sterilization of Syringes with Steam Pressure* (Ueber Sterilisierung der Injektionslösungen, Spritzen, Nadeln und eine neue Sterilisations-Trommel zur Sterilisierung von Spritzen im Ueberdruck-Wasserdampf). *Orosképes*, 1939, 29: 104

Most of the ampoules produced by manufacturers, sterilized either by heat or filtration, are considered as being free of bacteria. According to the author this is not always true. Those sterilized by fractional sterilization (tyndallization) and those made free of bacteria by means of the bacterial filter cannot be considered as absolutely sterile. This statement is even more applicable to aseptically prepared solutions.

For the sterilization of syringes and needles the following methods are usually employed:

1. After washing with ether they are placed in alcohol and kept there until used.

Boiling in water at 100° C. for from ten to fifteen minutes and then preserved in alcohol.

3. Boiling in water at 100° C. for from ten to fifteen minutes and immediate use.

4. Boiling in from 3 to 5 per cent soda solution in water for fifteen minutes, sterile rinsing, and immediate use.

5. Sterilization for from six to ten minutes with superheated steam at from 120 to 136° C. under from 1 to 2 atmospheric pressure.

6. Sterilization with dry heat at 60° C. for one and one-half hours and at 180° C. for one half hour.

Thomson considers the methods 1, 2, and 3 as satisfactory.

For the proper sterilization of syringes with superheated steam he has constructed a new drum divided by partitions into ten equal parts which are separated from each other. Each compartment can be opened by a separate metal door and is large enough to hold 2 to 5 cm. syringes with its necessary needles, all wrapped in gauze. In the floor and roof of the drum there are openings for the circulation of the steam. After sterilization these openings can be closed securely.

In conclusion the author states saprophytic bacteria with high resistance against heat can, even if rarely induce very severe and fatal infections. The very resistant pathogenic anaerobes occur everywhere. It is, therefore, not sufficient that instruments, syringes, needles, and bandages are made relatively free from living organisms, but all living organisms must be destroyed. Absolute sterility is

achieved by boiling at from 120 to 136° C. for from six to fifteen minutes in superheated steam under from 1 to 2 atmospheric pressure, or by exposure for one half hour to dry heat of from 60 to 180° C.

The source of infection after an injection may be the injection fluid, improper opening of the ampoule, unclean application of the injection needle, the skin of the patient, the hand of the surgeon, the syringe, the needle, the tissue damage caused by the solution injected, through which the latent organisms or those circulating in the patient's blood stream attach themselves and, finally the point of injection, which may become a locus minoris resistentiae in which the circulating organisms may multiply.

Only solutions in ampoules should be employed. It is necessary that the manufactured ampoules should bear not only the date of manufacture but the method of sterilization used, as well as the chemical reaction of the solution, the quantity of the preserving material, and the signs of beginning spoilage.

A complete dependable sterilization of the syringe and needles is obtained only by boiling them under pressure with superheated steam, or with high dry temperatures. The method advocated by Habermann—boiling for fifteen minutes in from 3 to 5 per cent soda solution and rinsing with sterile water—can be considered only makeshift. Alcohol should be taken from the list of sterilization fluids. In debilitated and septic patients an intravascular injection should be avoided altogether.

(E. Lids). Lenz J. 32. M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Robins, A B., and Ehrlich, D E. Group X-Ray Surveys in Apparently Healthy Individuals *Radiology*, 1940, 34 595

Although group x-ray surveys of convicts and suspects have been and are frequently made in connection with the tuberculosis problem, such studies confined to large numbers of apparently healthy individuals are lacking. Through the co operation of various agencies the authors have been able to subject over 73,000 individuals to such a study. They present their findings in considerable detail in this paper.

In choosing the method used for these group examinations, the authors were influenced by the following considerations:

The procedure must accurately diagnose tuberculosis in the minimal stage, and this can be done only radiologically, it must be adapted to the rapid examination of large numbers of individuals, it must be possible to carry out the studies in central locations, such as schools, institutions, or clinics, and the examiners must be able to move readily from one location to another, the results must be of good technical quality, readily capable of interpretation and review, and the cost must be low. The methods considered included tuberculin test, screening, fluoroscopy, x ray examination on celluloid film, and the rapid roll paper method. Only the roll paper method satisfied all of the requirements, and it was adopted. All of the material presented in this paper is drawn from surveys performed by this method.

The choice of groups to be studied was guided by the mortality and morbidity statistics on the influence of tuberculosis by age, sex, race, and economic status. Among those so examined were pre-adolescent children, high school and university students, applicants for employment in the Health and Fire Departments, persons suffering from venereal disease, homeless and non settled males, prisoners, and the population on home relief in certain sections of New York City. The incidence of tuberculosis in some of these groups is illustrated by graphs, as is also the occurrence of certain non-tuberculous conditions, including cardiac and osseous abnormalities. Each individual group is given separate consideration and the entire number are discussed and analyzed statistically.

From the material studied, the following summary and conclusions are arrived at by the authors:

1. Group x ray examinations of apparently healthy individuals are a productive method of finding tuberculosis cases, and should be a part of the program of all large public health organizations.

2. In such studies the incidence of clinically significant pulmonary tuberculosis varies with the age,

sex, race, and economic level of the population studied.

3. The incidence of active tuberculosis in Negroes is lower than in whites among the apparently healthy population.

4. The major portion of our efforts should be expended on adults and groups of the low economic levels.

5. The majority of the cases are discovered in the minimal stage of tuberculosis.

6. Abnormal cardiac outlines significant of organic disease of the heart or vessels are found in a sufficiently high percentage of cases to warrant the universal use of roentgenography.

7. In rapid examinations of large groups, the roll-paper method is the procedure of choice from the point of view of convenience, accuracy, and economy.

ADOLPH HARTUNG, M D

Dyke, C G., and Davidoff, L M. The Pneumo-Encephalographic Appearance of Hemangioblastoma of the Cerebellum *Am J Roentgenol*, 1940, 44 1

In 1926 Lindau described the occurrence of hemangioblastic tumors of the cerebellum which consist of a large cyst with a small mural nodule of solid tumor. The combination of cerebellar hemangioblastoma, angiomatosis of the retina, and tumors elsewhere has since received the name of Lindau's disease.

The plain roentgenograms in cases of hemangioblastoma of the cerebellum usually reveal only slight atrophy of the posterior clinoid processes, and of the floor and dorsum of the sella turcica. The characteristic features of the pneumo encephalogram in hemangioblastoma of the cerebellum are dilatation and rostral bending of the caudal half of the aqueduct of Sylvius, marked narrowing of the cisterna pontis and, usually, absence or marked compression of the fourth ventricle. There is usually present a certain degree of internal hydrocephalus involving the entire ventricular system rostral to the site of tumor. The degree of dilatation of the lateral ventricles is usually somewhat asymmetrical. The third ventricle is moderately enlarged and not displaced.

The explanation of the characteristic changes in the aqueduct of Sylvius and in the cisterna pontis is that the tumor, if in the vermis, is located either in the region of the declivity or superior to it, or, if in the lateral hemispheres of the cerebellum, occupies an increasingly superior position. The superior location of the tumor accounts for the difficulty, often insuperable, in disclosing the lesion at a primary operation. A suboccipital decompression permits the tumor to migrate caudally in the direction of the bony defect, presumably because of lessened resistance. The authors have found that in some instances

In high the tumor inaccessible to primary operation, re-operation at some later date revealed it to be within the operative field and reamenable to surgical removal.

HAROLD C. OGDEN, JR. M.D.

Schatzki, R. The Roentgenological Differential Diagnosis Between Cancer and Diverticulitis of the Colon. *Radiology* 94:0, 34-65

The difficulty of differentiating changes produced by inflammatory processes in some cases of diverticulitis of the colon from neoplastic disease is generally recognized. Numerous investigations have helped to decrease these diagnostic difficulties but have not obviated them. They are encountered not only in roentgenological studies but also in operation, and several instances are cited in proof of this. Inasmuch as resection of diverticulitis masses is connected with high operative mortality and is indicated in comparatively rare instances, the necessity of making the correct diagnosis before opening the abdomen is obvious.

Unless proctoscopy demonstrates cancer the responsibility of differentiating the growths from diverticulitis rests heavily and almost exclusively on the roentgenologist. It is the main purpose of the present article to stress the sometimes uncomfortable but unescapable responsibility.

The pathology of diverticulitis involves as it necessary the understanding of the differential diagnosis given brief consideration. Early inflammatory changes produce a tooth or cord-like appearance roentgenologically which is hard

to be confused with intraluminal cancer. Even the progressive changes of increased inflammatory swelling that produce cushion-like projections which separate long-necked diverticula leave little doubt of their true nature.

Differential diagnostic difficulties arise if inflammatory masses are arranged thickly over the entire length of the intestine beneath the mucosal surface. The resulting concentric contraction usually has a cone-shaped end and extends in most cases over fully half the part of the intestine. The middle of the intestine in the region of the cone-shaped beginning and ending of the lesion is usually not absolutely rigid, as can be seen by the changing lumen during an examination. The constricted area itself may or may not change in size and depends on the degree of rigidity. The mucosal folds are preserved and may or may not be a reflection of the lumen in the constricted area itself may vary from week to week and depends on the amount of cellular and serous, or fibrous element. It is characteristic of this type of lesion that in the presence of localized rigidity and of little evidence of the lesion within the rest of the bowel, the mucosal folds are preserved, although these folds may have a rather fixed arrangement which is unusual for the constantly changing pattern of the normal colon.

The most difficult problem in differential diagnosis arises in cases with complete obstruction. Repeated attempts with roentgen techniques may permit visualization of some of the involved area and help in the differentiation. Sometimes the appearance of the colon at the point of the obstruction is of great help.

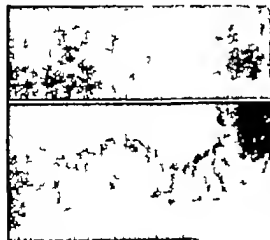
In cancer of the colon the defect produced by the tumor shows sharply defined margins. Instead of the normal mucosal fold one sees the irregular tumor surface usually with ulceration. Very commonly the colon proximal and distal to the cancer appears normal. Diverticula may be present proximal and distal to the tumor and may complicate the diagnosis, particularly in small lesions. Not only simple diverticulosis but also definite diverticulitis may be present, together with small cancer.

Enterocolonic tumors secondarily involving the colon may occasionally produce changes simulating diverticulitis or primary carcinoma. These are discussed briefly. Clinical manifestations usually help greatly in their differentiation.

Vernon H. Turner, M.D.

Zittinger, A. The Value of the Upright Position in Gall-Bladder Examinations. *Radiology* 99:0, 34-43

Ettlinger is convinced that the use of the upright position in gall-bladder examinations increases the accuracy of diagnosis and should be employed more frequently. Focusing the gall bladder by fluoroscopic examination obtains the most favorable angle and degree of compression for the roentgenogram is recommended.



Figs. a, upper. Small fibrotic area in the sigmoid due to diverticulitis. Note preserved mucosal folds in the area of narrowing. b, lower. Three months later the postoperative narrowing has improved. The mucosal folds are well preserved. (Clinical data 3 days previous to the first examination indicate the patient was operated on under the diagnosis of acute appendicitis. The operation showed diverticulitis of the sigmoid with perforation.)

Ettinger maintains that biles of various concentrations which do not mix can be present simultaneously within the gall bladder, and he believes this explains some observations of normal cholecystograms which have been hitherto obscure

As presented by the author, the diagnostic advantages of the upright position are elimination of doubt as to whether an observed negative or positive shadow lies within the boundaries of the gall bladder or belongs to another organ, ability to determine whether calcified stones clearly seen without the dye test are freely movable or are impacted, clarification in visualizing the anatomical configuration of the gall bladder, making possible proper identification of a congenital abnormality, revelation of minute transparent stones not visible in the usual film, elimination of the possibility of duodenal air overlying the gall bladder employment of certain angles for cases in which the dye ordinarily does not penetrate between the stones at the lower pole of the gall bladder, making diagnosis possible. Roentgenograms to illustrate each diagnostic advantage are presented

EARL GARSIDE, M D

Graziani, A The Roentgenological Examination of the Carpus (L'esame radiologico del carpo)
Radiol med, 1940, 27 382

A detailed analysis is made of the routine x-ray examination of the carpus and of the points imperfectly clarified by it. Modifications are proposed

In the dorsopalmar view three positions are described. In the first, the forearm is in pronation, the palm is on the cassette, and the long axis of the hand is continuous with that of the forearm. The second position is like the first, the central ray still being in the middle of a line which unites the styloid process of the radius with that of the ulna, but the hand is in ulnar deviation. The third position is

the same, the hand this time being in radial deviation

In the palmodorsal view, the three positions are similar to those of the dorsopalmar, with the dorsum of the hand resting upon the cassette

Examination of these projections reveals

1 In the dorsopalmar as in the palmodorsal view with the hand in ulnar deviation (Fig 1) a full profile of the scaphoid is obtained without the overlapping at the base of the distal third, a frequent site of fracture

2 In the palmodorsal position the superimposition of the capitate bone on the hamate is avoided and all the articulations of the two bones are clearly visualized

3 With ulnar deviation in the palmodorsal position (Fig 1) better visualization is obtained of the articulation between the hamate and the triquetral bones, along with partial dissociation of the pisiform and the triquetral bones

4 The palmodorsal projection shows the styloid process of the ulna in the A P position while the dorsopalmar shows it in profile, a fact which is frequently useful in designating the technique employed and in obtaining the desired visualization

The three positions of the radio ulnar view show the hand with the ulnar side resting upon the cassette, (1) with the long axis of the hand continuous with that of the forearm, (2) with the hand in flexion, and (3) with the hand in extension

In the ulnar radial view the three positions are as described above, the radial side of the hand resting upon the cassette

From the lateral projections the following observations may be made

1 Optimum visualization of the pisiform bone is obtained from the ulnar radial view, the long axis of the hand continuous with that of the forearm

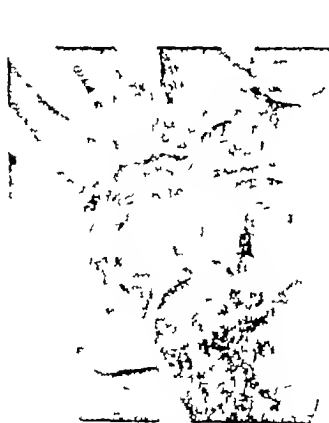


Fig 1



Fig 2



Fig 3

Fig 1 The right wrist in dorsopalmar projection, the hand in ulnar deviation

Fig 2 The right wrist in lateral radio ulnar projection the hand in flexion

Fig 3 The right wrist, oblique dorsoradial view

The ulnoradial view with the hand flexed (Fig 2) offers the best visualization of the scaphoid bone particularly in its distal half as well as of the articulation of the scaphoid with the greater multangular bone.

3. Both the radio-lunar and ulnoradial view with the hand in hyperextension delineate clearly the articulation of the capitulum distal bone.

4. The greater multangular and the lesser multangular bones are well isolated by the ulnoradial projection with the hand in hyperextension.

5. The identification of the triquetrum bone is always difficult in the ulnoradial view with the long axis of the hand continuous with that of the arm.

With reference to the plan which passes through the styloid processes of the radius and ulna, and that of the central ray four oblique projections are possible. The first is the oblique palmocubital and the oblique dorsocubital, made with the forearm side resting on the cassette. In the former the patient's arm is slightly rotated so that the central ray passes through the wrist from the dorsal to the palmar surface, the cubital side resting on the cassette. In the latter the arm is rotated in the opposite direction so that the central ray passes from the palmar to the dorsal aspect. With the radial side resting on the cassette the two corresponding oblique projections are made by rotating the forearm through 45 degrees in pronation and supination respectively.

The best visualization of the greater and lesser multangular bones is obtained with the oblique dorsocubital projection (Fig 3). While the oblique dorsocubital projection is not a perfect lateral projection the carpal bones stand in almost exact profile. The styloid process of the radius is best seen in this position.

The author suggests these modifications of the customary technique to assist in clarifying specific conditions. *EXETER HARRINGTON, M.D.*

Boulog, J. S., and Evans, J. R. Irradiation of the Long Bones for Gynecological Bleeding. *Am J Roentgenol* 94 43 87.

There is a certain proportion of cases of functional uterine bleeding in which all orthodox treatment has been used without result. The authors found that in a number of these cases the blood platelet count is low and they have designated this condition as uterine purpura. Because of the efficacy of splenic irradiation in idiopathic thrombocytopenic purpura, they instituted this treatment in such case with startling results. The uterine bleeding ceased abruptly after a duration of at least a year. The platelet count returned to normal and the patient experienced a sense of well-being.

Later, however, because no other symptoms of purpura were found in the condition under consideration, it seemed reasonable to the authors to conclude that the diminution in the number of platelets was due to deficient formation in the bone marrow rather than to an increased destruc-

tion by the reticulo-endothelial system. Irradiation of the long bones consequently instituted rather than the irradiation of the spleen and in almost all instances the bleeding was relieved. Coincident with the cessation of bleeding there has been a return of the platelet count to normal. A number of cases are reported in detail. It is noted that such x-rays have been used with similar immediate results but with less prolonged effects.

The amount of roentgen irradiation given has been variable but the factors generally used are 500 k. 50 cm. distance and filtration 5 to 7.5 mm. of copper plus 1 mm. of aluminum. One hundred roentgens are given over each thigh or leg at intervals of several days. *HAROLD C. OGDEN, M.D.*

Fried, J. R., and Goldberg, H. Post Irradiation Changes in the Lungs and Thorax. *Am J Roentgenol* 94 43 877.

Eighteen cases are reported in which post irradiation changes occurred in the lungs and thorax. This series does not represent all the cases of pneumonitis observed in the thorax clinic. Of the 8 patients, 4 died and post-mortem studies were made on 4. All cases are reported in detail.

Early roentgen studies of the lungs in these patients reveal varying degrees of inflammation, change. A common finding is hardening of irradiated portions. This is followed by the development of irregular patches of consolidation which frequently coalesce and radiate out and from the hilum. Such changes may occur after few and treatments or after single intensive course of irradiation over fields of moderate size. When the irradiated field are large concomitant pulmonary and pleural reactions are the rule. Adhesions may be observed between the pleura and pericardium, and between the diaphragm and pericardium or pleura. Pleural, pericardial, and occasionally interlobar effusions may occur. The late stages of severe lung damage are dominated by evidence of fibrosis. The normal architecture of the lung may disappear. Atelectasis of the involved areas and compensatory emphysema of the non-involved portions of the lungs are common. The diaphragm shows numerous depressions. The heart and trachea are retracted and the mediastinal side. Pleural thickening may be marked and may obscure the lung markings. The thorax usually becomes markedly contracted. With the passage of years, fairly large and sharply outlined calcified plaques may appear on the irradiated lung or pleura. Patients with lung damage of any extent show damage of varying severity to the overlying chest. When the total dosage is high, rarely lung osteitis may occur. The ribs and fracture may result.

The earliest clinical signs are cough which is usually non-productive, dyspnea, and pain at the site of treatment. Fever and chills may occur. When permanent marked fibrosis occurs the cough is persistent the dyspnea progressive and especially marked on the least exertion and the chest pain severe. Repeated upper respiratory infections are

likely to occur. The end stage of the severe type of reaction is characterized by symptoms of failure of the right side of the heart.

Macroscopically the irradiated portions of the lungs present atelectasis, a firm consistency, and increased resistance to cutting. The cut surfaces may show obliteration of the normal lung markings. Injection of the pleura, fibrinous deposits, and extreme thickening are observed. Microscopically, inflammatory changes are found in the lungs and pleura. Marked fibrosis and hyalinization may be present in severe cases. Hypertrophy or dilatation of the right side of the heart is frequently observed.

The authors conclude that massive doses of irradiation, particularly if repeated at close intervals, are likely to produce such changes as they describe, even if the total dosage is not high. Irradiation which is limited to the lung periphery is less likely to produce serious injury than heavy irradiation over the mediastinum and large vessels. Although no injury resulted with the earlier series in these cases, previous treatment can be the basis for later damage, if subsequent treatment is not given with great caution. Elderly individuals with arteriosclerotic changes are more likely to have pulmonary and pleural damage. Respiratory symptoms such as cough, dyspnea, and chest pain are danger signals.

HAROLD C. OCHSNER, M.D.

Wilkie, J. Two Cases of Fluorine Osteosclerosis.
Brit J Radiol, 1940, 13, 213.

The literature relating to skeletal changes in individuals exposed to fluorine compounds is reviewed briefly. According to Roholm, cited by the author, the bone changes are generalized, although there is a

predilection for certain places. The pathological process is a diffuse osteosclerosis in which the pathological formation of bone starts in both the periosteum and the endosteum. The bone densifies and thickens, the medullary cavity decreases in diameter. There is considerable new formation of bone from periosteum, and ligaments that do not calcify normally, or that calcify only in advanced age, undergo a considerable degree of calcification. All signs of bone destruction are absent from the picture.

Two cases with characteristic osteosclerotic changes are cited by the author with detailed descriptions of the roentgen findings, some of which are illustrated. Brief mention is made of differential signs from osteitis deformans, syphilitic osteitis, and osteoblastic metastases.

ADOLPH HARTUNG, M.D.

MISCELLANEOUS

Paschoud, H. Ultraviolet Irradiation of Soiled Wounds (Irradiation ultra violette, primaire, des plaies souillées). *Presse méd*, Par, 1940, 48, 387.

The author reports 4 cases in which ultraviolet irradiation was used in treating soiled wounds. The author believes that his success in using ultraviolet irradiation warrants trying this method on wounded soldiers. His method is to wash out the wound, remove all evident devitalized tissue, then wash with hydrogen peroxide, after this the wound is irradiated with the ultraviolet rays and then it is sutured. The ultraviolet irradiation is done by means of a special apparatus which enables the tissues to be brought into direct contact with the rays.

FREDERIC W. ILFELD, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Farmer, C. J. Abt, A. F. and Chinn, H. The Absorption of Vitamin C (Ascorbic Acid) from the Intestinal Tract in Health and Disease. (West Hall, Northwestern U. S. Med School 949, 4-4).

A review of studies on Vitamin C absorption and excretion is given, summarized as follows:

In health, the absorption of Vitamin C (ascorbic acid) from the intestinal tract is nearly complete. With ordinary oral intake, fecal excretion is usually not over 5 mg. ascorbic acid in 4 hours. With massive oral doses (up to 1000 mg. per day) the fecal excretion is normally under 5 mg. per day.

From experiments on rats and guinea pigs, Vitamin C is believed to be absorbed by diffusion or osmosis. No evidence of phosphorylation as a requirement for absorption through the intestinal mucosa could be obtained.

No evidence of enhanced fecal excretion accompanying high plasma levels could be obtained. The re-excretion of ascorbic acid from the blood into the intestine is considered likely but cannot be excluded from our present state of knowledge.

Certain types of bacteria have been cultured by special technique from human gastric contents and from guinea pig feces which utilize ascorbic acid. Glucose is utilized in preference to ascorbic acid, here it is simultaneously present.

Under certain abnormal conditions of the gastrointestinal tract associated with abnormal bowel movement (catarrhs, diarrhea, ulcerative colitis) marked losses of orally administered Vitamin C may occur. These conditions frequently are severe enough to decrease the plasma ascorbic acid level as well as the amount excreted in the urine. In such cases, as well as all others with low plasma ascorbic acid levels, intravenous administration of large amounts (one gram daily) of ascorbic acid is an essential preoperative procedure.

P. STAR MD

Johnson, J. Ravdin, I. S., Vora, H. M. and Zintel, H. A. The Effect of Diet on Composition of the Liver in the Presence of Obstruction of the Common Bile Duct. *Arch Surg* 949, 4-4.

The histological picture of the liver in obstruction of the common bile duct is often one of extensive hepatocellular fibrous tissue replacement, parenchymal degeneration, and fatty infiltration. Prior to operation, test of hepatic function may give little or no indication of the degree of injury to the liver parenchyma. However, subsequent to the trauma of operation and anesthesia, hepatic function may become so evident as to jeopardize the patient's life.

Because pre-operative preparation is of almost importance, the authors performed experiments on dogs to determine the diet best suited to prepare the "bad risk" for operation in cases of disease of the liver.

The common bile ducts of the dogs were ligated, and specimens of liver were taken for assay of glycogen and fatty acid content before and after the administration of various types of diet. Ligation of the common bile duct produced an increased hepatic concentration of fatty acids, much the same as is seen after obstruction of the common duct in man.

A high carbohydrate diet was given to one group of dogs for fourteen days, supplemented in part by intravenous glucose. This as found to produce 50 per cent reduction in the mean concentration of fatty acids in the liver. A second group of dogs received high carbohydrate regimen plus choline chloride. Although it was found that choline chloride exerted some lipotropic action when not administered in excessive doses, it is believed that suitable high caloric diet could have resulted in more significant decrease in the lipid concentration.

Seven dogs were fed mixed diet, receiving half their total calories in the form of carbohydrate and a quarter each as protein and fat. The mean reduction in fatty acid concentration over seven-day period was 39 per cent, which is similar to that obtained when high carbohydrate diet reinforced with choline chloride was given.

Another group of dogs received high protein, high carbohydrate diet, in which 72 per cent of the total calories were in the form of carbohydrate and 3 per cent protein. With this regimen not only the fatty acid concentration of the liver markedly reduced in minimal period, but the glycogen concentrations were all 2, or considerable above, the normal level.

An adequate caloric intake is shown by the authors to be of great importance and they feel that too much emphasis has been placed on the intravenous administration of dextrose to jaundiced patient and too little on the oral intake of food. From 3,000 c.c. of 5 per cent solution of dextrose the patient receives only 600 calories, which is little more than one-third of the daily basal metabolic requirement. If the glycogen content of the liver is to be increased significantly, carbohydrates and other foods must also be given by mouth. To the extent that carbohydrates given by mouth displace liver fat and spare liver protein, the liver will be protected against the effect of certain hepatotoxic agents (volatile anesthetics). Regeneration of degenerated parenchymal cells requires protein, either endogenous or exogenous, which fact gives new significance to the adequate oral intake of protein.

If the oral route of intake is impossible, the intravenous method should be utilized, but if there is no

contraindication to the oral route it should be used in order to maintain a high caloric intake. If the caloric intake is low, it is especially important that the diet contain no fat.

Thus, a high carbohydrate, high protein, no fat diet is recommended in the pre operative preparation of the seriously ill patient with disease of the biliary tract.

HAROLD LAUFMAN, M D

Scalzo, G. Research Studies on the Nerves of the Human Umbilical Cord (*Ricerche sui nervi del funicolo ombelicale umano*) *Riv ital di ginec*, 1940, 23 253

The author reviews the important literature and notes that most of the authorities on microscopic anatomy have concluded that no nerve fibers have thus far been demonstrated in the human umbilical cord. However, he examined the umbilical cord of 50 full-term fetuses by the Bielschowsky-Gros method. The cord was divided into three sections and these were studied in transverse and longitudinal views. He was able to demonstrate non myelinated nerve fibers through the stroma and along the walls of the umbilical vessels, especially in the two thirds of the cord near the fetus, but it was difficult to demonstrate nerve fibers in the other third of the cord.

Photomicrographs are presented which definitely illustrate these nerve fibers and fibrils.

JACOB E. KLEIN, M D

McDowall, R. J. S. The Circulation in Relation to Shock. *Brit M J*, 1940, 1 919

In his inaugural lecture on surgical physiology before the Royal College of Surgeons, McDowall reviews the essential nature of shock and denotes lines along which new knowledge is needed.

The vicious cycle of established shock leading to death is generally understood and agreed upon, but differences of opinion exist as to the initial nature of shock and the pathological states found which are related to the methods of production of shock. The pathological approach to the problem is obstructed by delay in securing authority for post-mortem examination and by the movement of the blood after death. From the standpoint of surgical physiology the 'lost blood' is only half the problem in shock and simply replacing it by transfusion often fails because of the reduced peripheral resistance. When the peripheral resistance of the circulation is reduced it is not possible to raise the arterial pressure without raising the venous and capillary pressure and thus increase capillary filtration. For this reason transfusion is of greater value in hemorrhage, which causes peripheral vasoconstriction. Unfortunately no satisfactory method of raising peripheral resistance is known. Drugs which are general vasoconstrictors act deleteriously on the heart and coronary arteries. The causes of shock in the probable order of their importance are (1) hemorrhage, (2) toxins, (3) excessive vasoconstriction, (4) reflex vasodilatation, (5) excitement or depression, and (6) central exhaustion and injury with loss of carbon dioxide.

The *modus operandi* of obvious hemorrhage in producing shock is clear. The relative importance of concealed hemorrhage, as in a crushed limb, and the absorption or local action of toxins in such a limb are more difficult of evaluation. Even Dale now agrees that histamine is not the substance responsible for traumatic shock. Some other histamine like substance, however, may be concerned. The main plank of the toxic theory was originally the observation of the onset of shock upon release of the tourniquet from the crushed limb. Blalock showed that the artery is more important than the vein, and that shock does not occur if the artery is clipped and the vein left open. This type of shock, therefore, is now interpreted as due to the taking up of blood by the injured part. Nevertheless, there are many phenomena which at present can be explained only by a toxic theory.

The rôle of the nervous system in shock is a subject of considerable confusion. Crile's idea of exhaustion of the vasoconstrictor center has been shown not to hold in the majority of instances, since the arteries are often constricted and the center still responds to suitable stimuli. This does not mean that the nervous system cannot play a rôle in other ways. The complex factor of overstimulation of the sympathetic adrenal system which can produce shock with blood concentration and low blood volume in experimental animals may operate clinically. Certain facts are very suggestive of such a nervous mechanism. For example, it is known that in injury and operation there is a considerable element of fear and pain, and that cold is detrimental to shocked cases. The common rise in the blood pressure preceding the onset of shock and the hemoconcentration preceding the fall in the blood pressure could be the initial result of overstimulation of the sympathetic adrenal system. The clinical importance of the sympathetic adrenal factor lies in the possibility that the administration of adrenalin-like substances may do harm, and that pharmacological agents which reduce sympathetic activity might be more desirable in shock therapy.

Another rôle of the nervous system in shock, in contrast to overstimulation of the sympathetics, may be an inhibition of the vasomotor mechanism through afferent stimuli. Experimentally this phenomenon can be demonstrated by a fall in the blood pressure resulting from slight repeated trauma such as tapping of the tibia. The results depend somewhat on the type and depth of anesthesia, but the immediate cause of the fall in pressure is uncertain. There are several objections to accepting this mechanism as the cause of clinical shock resulting from slight or severe trauma in unanesthetized patients.

The value or danger of anesthetics in clinical shock is also unknown. If the shock were on a purely neurogenic basis anesthetics should be of value. Lister made the observation that the use of chloroform materially reduced postoperative shock. This has been confirmed by many surgeons. However, in

obviously toxic shock the giving of a anesthetic such as ether or chloroform may cause a fatality. If the nervous factor is not contributory to the shock then. If anesthetics, including morphine, should be avoided because they reduce the mechanism compensatory to hemorrhage and capillary dilatation.

Other fields of investigation in shock such as the depression of the sympathetic system following stimulation, the loss of carbon dioxide with over ventilation, and the relation of the adrenal cortex because of its effect upon capillary permeability and salt balance require further study.

JOSE L. LINCOLN, M.D.

Deckwirth, E. The So-Called Scalenus-A ticus Syndrome (Ueber das sogenannte Scalenus aticus-Syndrom). *Bleicherode*. H. Carl Neft, 1929.

The thor has studied 500 ray films at the Surgical Clinic of Berlin with reference to the nature and frequency of the occurrence of anomalies of the cervical vertebrae. He found anomalies of the most varying grades in 9 per cent of the cases. Those of the mildest grade which are placed in the Group 1a and b according to the classification of Gruber Wankle (hypertrophic transverse processes and small rib spurs which do not encroach upon the transverse process) occurred twice as frequently (8 per cent) as the higher grade of cervical-rib formations which encroach more or less upon the transverse process and may take on the appearance of thoracic rib (Groups 3, and 4, according to Gruber classification). In Wankle's study the relationship between these two grades was 5:6. Only small portion of the cervical-rib anomalies present typical complaints.

By scalenus-a ticus syndrome term which the thor has borrowed from Ochsner and Nixberger is meant nervous and sympathetic as well as vascular complaints and disturbances in the region of the brachial plexus and the subclavian artery. Only those cervical ribs which are the cause of significant anatomical changes should be removed surgically. Milder conditions should be treated conservatively. In 11 cases which are characterized by muscular insufficiency division of the anterior scalenus muscle is indicated (Adson-Coffey).

(W. 1932) HARRY A. SALER, M.D.

Combes, F. C., Dietrich, C., and Cohen, J. Keratosis Bleennorrhagica. A Brief Review and Report on the Effects of Hyperpyrexia in Its Treatment. *J. Am. Med. Ass.* 1940, 4: 2078.

Keratosis bleennorrhagica is distinct entity characterized by poliarthritis and cutaneous keratosis in the presence of gonorrheal infection. The disease is rare. Keim in 1924 was able to find only 38 cases in the literature. In 1933 Chambers and Koettler listed 6 additional cases including of their own. Since then the authors have found 9 case reports, which makes total of 53.

The onset of keratosis bleennorrhagica is insidious and follows chronic and recurrent attacks of gonorrhea.

rethrititis associated with chronic proctitis and seminal vesiculitis. Chills and fever of septic type herald the appearance of each crop of new lesions. In extensive cases there is profound prostration, anorexia and great loss of weight. The distribution of the eruption is symmetrical. There is a predilection for the soles and palms, genitalia and groins. Less often the scalp, dorsum of the hands and feet, and the forearms and legs are involved. Lesions may also be found on the trunk, but this region and the face are not frequently affected. Barrett, Berman, Sherman, Blumenthal and Hekler, Welch, Genger and Boas, and Chambers and Koettler report lesions seen on the mucosa of the cheek, tongue, and hard palate.

Briefly stated, the pathological process of the lesions of the palms and soles consists of vesiculation, pustulation and crusting with associated keratosis. The lesions of the nails appear as a heaping up of yellow, waxy material beneath the distal end of the nail plate. The nail itself becomes dry, brittle, and opaque and is lifted from its base. The free border is rough, broken, and jagged. These subungual hematomas are tender and may become painful.

In the mouth, flat confluent grayish papules are present. They are distributed irregularly over the hard palate, cheeks, and borders of the tongue.

There are also lesions of the joints, which usually precede the cutaneous lesions, although in rare instances they may be entirely absent. The joint manifestations differ from the usual gonorrheal monoarthritis by the simultaneous involvement of a large number of articulations. The palms are extending but there is not as much redness and periarticular edema as is seen in rheumatoid arthritis or in monoarthritis gonorrheal arthritis.

The progress of the disease is chronic with remissions and recurrences and fresh crops of lesions attending the exacerbations of febrile and arthritic symptoms or induced by the therapeutic injection of gonococcus vaccine.

Modern treatment has improved the prognosis and has only affected the duration of the disease. Local treatment is of little value. The most effective therapeutic procedure is the production of artificial fever by means of the endotoxin. The primary focus of infection must, of course, be eradicated. Non-specific protein therapy and general supportive measures are also indicated.

SARAH H. KLEIN, M.D.

Green, R. G., Goodlow, R. J., Evans, C. A., Peyton, W. T., and Titus, L. A. The Transmission of Human Papilloma to Monkeys. *Am. J. Cancer* 1940, 39: 6.

Persistent effort by numerous investigators seeking to transmit malignant tumors from human beings to laboratory animals have failed to produce adequate proof of successful transmission or transplantation. Although considerably less effort has been devoted to the transfer of benign and pre-cancerous tumors of man, successful results have

been obtained much more frequently with these lesions than with malignant tumors. More extensive study along this line would seem to be warranted for, as precancerous lesions, benign tumors may be related to malignant growths. Moreover, many destructive tumors of human beings are made up of cells that are fundamentally benign. Adenomas of the islands of Langerhans and astrocytomas, for example, are benign in the sense that they usually grow rather slowly and do not metastasize, yet both are commonly fatal.

During the past two years the authors have attempted by various methods to transfer both benign and malignant tumors from human beings to monkeys and rabbits. Most of their experiments have yielded negative results. They have, however, obtained some positive findings that appear significant. In this article they report the transfer of a cutaneous papilloma of man to the macaca rhesus, with observations that strongly suggest the presence of a filtrable virus.

The tumor used in their experimental study was a small, highly cornified papilloma on the skin of the left upper eyelid of a man aged seventy-one years. Inoculation of the eyes of 3 monkeys with a saline suspension of this finely ground, cutaneous papilloma resulted, in all 3 cases, in the proliferation of conjunctival epithelium to form small tumors at the inoculation site. The injection of the tumor suspension was accomplished by passing the needle through the conjunctiva lateral to the limbus of the eye, then medially and anteriorly through the sclera, the outer border of the ciliary body, and the iris, into the anterior chamber. After a small amount had been injected into the anterior chamber, the needle was withdrawn, inoculating tissues in its path.

The tumors developed simultaneously after an incubation period of about thirty days, and attained maximum growth within the following thirty days.

Although it is possible that a heterotransplantation from man to monkey took place in the experiments, this is doubtful, for it is highly improbable that this would have occurred so uniformly in all 3 animals inoculated. It is well known that the direct heterotransplantation of tissues is rarely, if ever, successful among higher mammals (except, perhaps, as an independent tissue growth in the ocular chambers). Intensive study of serial sections of 2 of the 3 tumors produced in the monkeys revealed that the lesions were composed of hyperplastic epithelium continuous with the conjunctival epithelium. It seems most unlikely that human epithelium would merge with the epithelium of the monkey to produce such continuity. It is noteworthy that 3 tumors were produced by 3 inoculations of the same material. This fact, in view of general failure of the transfer of human tumors to animals, precludes an accidental result. All 3 lesions appeared simultaneously after an incubation period of about thirty days and all reached maximum or nearly maximum growth within another thirty days. These observations point to a uniform process as a basis of the

growth of the tumors and suggest the presence of a virus.
JOSEPH K. NARAT, M.D.

Trèves, N. Recent Therapeutic Measures to Control Pain in Cases of Incurable Cancer. *Med Clin North Am*, 1940, 24: 595.

Trèves reviews the use of drugs used for relief of pain in cases of incurable cancer. Narcotics should be used only as a last resort because many of the patients linger on for some time and the amount of drug needed for relief may then be very large. Mild hypnotics and sedatives should first be employed in minimal doses, the amount being increased when necessary. Phenobarbital, sodium amytal, nembutal, and seconal are recommended. When these fail, codein and, finally, morphine should be used. Dilaudid, being better tolerated, produces a more effective analgesia.

Intravenous alcohol infusions of 33 per cent ethyl alcohol solution are used in doses of 1 c.c. of alcohol for each kilogram of body weight. They are administered through the usual infusion set at a rate of 30 or 40 drops per minute, and given every third day. The amount is increased until from 450 to 600 c.c. are given at one treatment. Trèves used this in 8 patients with relief in 6 and no relief in 2.

Large doses of calcium given intravenously give marked relief in metastatic carcinoma of the bone. Ten per cent calcium gluconate was given in a dose of 10 c.c. three times a day for one month. However, this must be continued indefinitely. Because of the lack of vitamins, more striking results may be obtained with the addition of Vitamins A and D.

Cobra venom is supposed to work like morphine on the higher cerebral centers. Morphine works faster but its effect is lost rapidly. Cobra venom works slower but once analgesia is induced it lasts longer. The usual dose is 5 mouse units, 1 c.c. ampoule is injected daily until analgesia is obtained. After that two or three intramuscular injections a week are sufficient. Trèves found that in many instances analgesics and narcotics could be reduced and finally omitted after the venom had produced its analgesia.

Because of a lack of vitamin intake in carcinoma patients, large doses of Vitamin B₁ often tend to ameliorate the symptoms. The general improvement may lead to increased resistance to pain.

The use of these substances will not replace analgesics and hypnotics, but their administration often decreases the amount of such drugs that are used to control pain.
JOHN J. MALONEY, M.D.

GENERAL BACTERIAL, PROTOZOAN, AND PARASITIC INFECTIONS

Mellon, R. R., Locke, A. P., and Shinn, L. E. The Anti-Enzymatic Nature of Sulfanilamide's Bacteriostatic Action. *Am J M Sc*, 1940, 199: 749.

A new anti enzymatic theory is offered for the basic mechanism of the therapeutic effectiveness of

It is shown that in animal experiments a status thymicolymphaticus may be induced by injections of thymus hormone, and that in this condition, exactly as in the case of the human being, death may result from the slightest of external influences. Especially marked is the sensitivity to choleraform of the thymus treated animal. Status thymicolymphaticus is therefore, a manifestation of hyperfunction of the thymus gland.

It is found that thymic death is an acute cardiac death induced by a lack of heart-muscle glycogen. It is demonstrated that in the rat and in the guinea pig the thymus hormone may produce a marked decrease in the glycogen content of the heart muscle. It is brought out that in infants similar conditions are found physiologically, as both the liver glycogen and the glycogen of the cardiac muscle, when apposed to values found in the adult, are under normal.

With reference to the occurrence of the thymus hormone, the hormone is present in larger amounts only in the thymus of younger animals, in older animals the content is much lower. From one tenth to one twentieth of the amount present in the thymus gland may be found in the lymph glands and spleen, it depends upon the volume of the thymus. The hormone is not present in the serum in free solution as the other hormones, it is bound to the lymphocytes. The lymphocytes must, therefore be regarded as the carriers of the growth principle. It is believed that the lymphocytes produced in the lymph glands are drawn to the thymus gland, filled with the hormone, and then stored in the cortex of this organ, they are then given off to the blood and broken up at the place where needed. Various proofs are advanced for this theory, among others, the demonstration that only the stratum of white corpuscles of the blood contains the thymus hormone. It is shown further that in a number of different diseases which begin with a lymphocytosis there is a marked secretion of thymus hormone. A method is given for demonstrating the excretion of thymotropic hormone and thymus hormone in from 50 to 100 ccm of urine. Finally, it is shown that myasthenia has nothing to do primarily with the thymus, the thymic hyperfunction in myasthenia is a secondary phenomenon produced by primary changes in the suprarenal cortex.

The experimental results here reported were procured on a material consisting of several thousand experimental animals.

(BOMSKOV) JOHN W BRENNAN, M D

Rehn, E. The Thymus Hormone from a Clinical Standpoint (Das Thymushormon unter klinischer Betrachtung). 64. Tag d. deutsch. Ges. f. Chir. Berlin, 1940.

The hormone of the thymus gland is one of the most important factors in the processes of living and of growth. Of the innumerable problems in connection with this hormone we will here discuss that of hyperfunction of the thymus. The starting point for

clinical study of the thymus is the possibility of demonstrating, and the quantitative determination of, the function of the thymus.

In dysfunctions, particularly hyperfunction, there is a severe disturbance of hormonal balance, which finds expression in a very well defined organic lability. Hyperfunction of the thymus leads to glycogen impoverishment of the heart and liver. This new form of glycogen depletion resembles in its hormonal origin the liver disturbance of thyroid origin demonstrated by Rehn, but it differs from it essentially. The thymic variety eventuates early with glycogen exhaustion of the liver and thereby attains the highest grade of lability. Herein resides the essential character of status thymicolymphaticus, and an explanation of the specific lability of children toward operation and narcosis is made possible. The intense hormonal activity of the period of puberty includes that of the thymus, and it is in connection with the latter that acromegaly and eunuchism have their origin. The constitutional status thymicolymphaticus is found also in the adult and may be induced in man and animal artificially by the administration of thymus hormone. A hyperfunction of the thymus has been suspected and proved in morbus Basedow, carcinoma, infections, and toxic affections, and in lymphogranulomatosis. In these diseases the participation of the thymus gland is definitely established by a quantitative test for the hormone in the urine. Fifty cubic centimeters of urine suffice for the determination of the thymic and thymotropic hormones. The normal limits of excretion go as high as 200 mouse units. Further indications are, in addition, a lymphocytosis, leucocytosis, hyperglycemia, and, lastly, myasthenia, the last named, however, results from an accompanying effect of the thymus on the suprarenal glands.

In Basedow's disease the hyperfunction is secondary and primary, in the first type the effect is an entirely laudable reaction to the thyreogenic Basedow's disease on the part of the thymus, in the second, the hyperfunction is an expression of a disturbance of the entire gamut of hormonal correlations. There must be distinguished a pure thyreogenic Basedow's disease, a thymothyreogenic, and a thyreogenic Basedow's disease with secondary participation of the thymus. These forms can be definitely determined and from this fact arises the possibility of defining these forms in advance and of working out definite precepts for their treatment. In the thyreogenic Basedow's disease a cure may be obtained by resection of the thyroid gland without risk if there be proper pre-operative preparation of the patient with iodine, or by the administration of thymus hormone after its antagonistic action on the thyroid gland has been ascertained. In the future, in patients with Basedow's disease in whom there is involvement of the thymus both organs must receive preliminary treatment, the operative menace must be reduced by weakening the influence of the thymus, and then the operation should be performed with or without the pre-operative administration of

iodine the method depending upon the basal metabolism. In the future in every case of Basedow's disease there must come a test, not only the basal metabolism but also the function of the thymus. In the cases of carcinoma, in which operation is dangerous, there has been found marked involvement of the thymus, a condition of lability such as is encountered in the much feared status thymico-lymphaticus. In these cases the thymus condition is for the present to be regarded as secondary the same thing may be demonstrated in the child with an acute purulent osteomyelitis and with severe general infections. This is undoubtedly a toxic induced irritation of the thymus. Of the greatest importance are the results of the study of lympho-granulomatosis, in one case of which thymus hyperfunction of such enormous proportions was found that at the period when the patient was examined severe hormonal disturbance had to be assumed.

Manifestations speaking for marked involvement of the thymus in Hodgkin's disease are (1) intense hyperfunction of the thymus (2) the demonstrated interrelationship between the thymus and the lymphatic system (3) the addition of marked leucocytosis and lymphocytosis by the giving of few milligrams of thymus hormone (4) the marked irritation of the lymphatic system by the hormone administered, (5) the increase in Hodgkin's disease at the period of puberty and (6) the results from irradiation of the thymus in cases of lymphogranuloma.

All the glimpses into the nature of hormonal processes, the purport of which cannot yet be foreseen, lead to the expectation that the theoretical basis now established over wider and more definite results will be forthcoming.

In the discussion SUNDER PLASMANN demonstrates in the thymus and thyroid, special, large clear cells, which, on the one hand, show the closest kind of plasmatic connection with the vegetative nervous system, and on the other stand in close relationship to the colloid resorption of the thyroid. In the thyroid which has been activated with thyrotropic hormone, they are present in great numbers. In the Basedow struma however they are just as plentiful. These are the cells which are the most important in the epithelialization of the thyroid and the thymus in Basedow's disease. Sunder Plasmann designates them neurohormonal cells (nb cells). They are perhaps identical with the interstitial cells of Cajal in the walls of the stomach and intestines. In Basedow's disease they migrate in large numbers from the thymic medulla into the follicular complex of the thyroid, and during this migration some are found in Schwann's terminal plasmodium of the perivascular nerve plexus and some in the neuroreticulum of the peritracheal loose fatty tissues then they produce an increase of the mucous secretion of the thyroid.

Sunder Plasmann's results support the theory that the enlargement of the thyroid in Basedow's disease, particularly of the medullary hyperplasia,

represents, in the sense of Haberer a manifestation of aggravation of this disease.

(Review) JOHN W. BARN, M.D.

SURGICAL PATHOLOGY AND DIAGNOSIS

Eichewerry, M. A., Battaglia, A., and Tropiano, A.: Chedial's Microreaction (Microreacción de Chedial). *Rev. med. quim. de patol. fecund.* 1, 910, 5-5.

Chedial microreaction for the diagnosis of syphilis requires only one drop of deoxygenated blood, the necessity of puncture of veins, which is undesirable in anxious patients or difficult in those with sclerotic blood vessels, is thus avoided. Furthermore, the technique of the reaction does not require syringes, pipets, or test tubes. The antigen is added and the specimen observed under the microscope. The presence of black granules indicates positive reaction.

The authors performed 7 Chedial microreactions in conjunction with the Wassermann and Kahn reactions. When the last 4 reactions were positive Chedial's reaction was also positive. The Chedial reaction was also positive in 95 per cent of the cases with a positive Wassermann reaction, and

corresponding result as obtained with the new reaction in 97 per cent of the cases with positive Kahn reaction. 1 of 835 patients with negative Wassermann and Kahn reaction, positive Chedial reaction was recorded.

The authors highly recommend the Chedial reaction for the diagnosis of syphilis. Non-specific positive reactions do not exceed 1 per cent. The sensitivity of the Chedial reaction is approximately the same as that of the Kahn and is superior to that of the Wassermann reaction.

JOSEPH K. NARAY, M.D.

EXPERIMENTAL SURGERY

Noble, G. K., and Witter, M.: The Effect of Testosterone Propionate on the Black-Crowned Night Heron. *Endocrinology* 910, 26-37.

The authors carefully describe changes which both sexes of the black-crowned night heron undergo during the breeding season. These changes consist of marked increase in the pigmentation of the lower mandible and buccal cavity, and an intense vascularization of the legs which gives them pink color. These modifications disappeared following gonadectomy. Testosterone propionate injected in large doses was found to produce these sexual changes in immature herons and in gonadectomized adults. The estrogens on the other hand, had no effect on the secondary sexual characteristics.

It is concluded, therefore, that the secondary sexual characteristics of the night heron are produced by the androgen in both sexes. Both testosterone propionate and the estrogens are observed to cause an enlargement of the ovioviduct of the spayed night heron, though only the estrogens were found to

produce a hyperplasia of the mucosa. The epididymis was hypertrophied by testosterone propionate but was unaffected by the estrogens.

Testosterone propionate induced male sexual behavior in adult females or in immature birds of both sexes. It was observed to make the voice guttural even in month-old chicks. One month old chicks being treated with testosterone demonstrated the drive for territory defense and nest building, all male courtship ceremonies, copulation, and later brooding. Differences between the male and female behaviors in adults seemed to be regulated by the amount of androgen in the tissues of the two sexes. Estrogens alone failed to stimulate any breeding behavior in either sex. RULON W. RAWSON, M.D.

Cazzola, D. A Contribution to the Question of the Relations Between Sexual Hormones and Foà Kurloff bodies (Contributo alla questione dei rapporti tra ormoni sessuali e corpi di Foà Kurloff) *Folia demographica* 1940, 37: 170.

Cazzola recalls the experiments of Babudieri who thought that it might be possible to use the Foà Kurloff bodies as a test for the dosage of male and female hormone preparations and who obtained some promising results. Therefore, the author decided to repeat these experiments from the practical point of view in order to verify whether the new diagnostic method could be applied to everyday laboratory investigations. He used newly born guinea pigs (aged one or two days) of both sexes. First he determined the number of Foà Kurloff bodies present in the blood and then injected on two consecutive days 2 c cm of urine from women in various stages of pregnancy. The blood was examined from the third day on until the number and the morphological aspect of the Foà Kurloff bodies returned to normal.

He found that in the successful experiments the number of bodies increased gradually from the fifth day after the beginning of the treatment, when an average of 3 per cent was observed, to reach 5 or 6 per cent on the ninth or tenth day, and then to decrease more or less rapidly toward normal. The same experiments were also made with urine from women in the four first days of the puerperium, and controls were instituted with urine from non-pregnant women and from male subjects; the controls always gave negative results. However, investigations on young guinea pigs which had not been treated with urine from pregnant women showed that the number of Foà Kurloff bodies also increased gradually during the first days of life to reach percentages which, although lower, did not differ much from those of the treated animals.

He presents the following conclusions:

The Foà Kurloff bodies react with an increase to the injection of urine from women in the seventh to ninth months of pregnancy, but they do not show any change when the urine of the first months of pregnancy is used. The gonadotropic hormone does not influence the number of the bodies, the increase of which must be attributed to the action of the

follicular hormone present in the urine. During the first days of the puerperium, the decrease of folliculin is associated with a rapid, progressive fall in the number of the bodies. All animals do not react with equal intensity to the injection of urine. The injection of 4 c cm of urine during the first two days of life kills many guinea pigs. If the treatment is prolonged with doses increasing from 0.5 to 2 c cm of urine for more than five days, all animals are saved and the percentage of Foà Kurloff bodies is increased, the reading being deferred to the tenth, eleventh, or twelfth day. From the theoretical point of view, the diagnostic method of Babudieri has an undoubted value, but it does not seem probable that it will enjoy any extensive practical applications.

RICHARD KEMEL, M.D.

Dill, L. V., and Isenhour, C. E. An Attempt to Produce Increased Susceptibility to Renal Ischemia in Rabbits by Means of Endocrine Preparations. *Endocrinology*, 1940, 26: 863.

The authors, believing that the agents which convert the renal-ischemia syndrome from a benign hypertensive state in the non-pregnant animal to a malignant fatal disease in the pregnant animal might be hormonal, undertook experiments designed to determine if one or more of the commonly used glandular extracts were able to change the response of the non-pregnant rabbit to renal ischemia.

Rabbits weighing between 2 and 3 kgm were given varying dosages of several commercial preparations. While receiving the hormone preparations, the rabbits were subjected to renal ischemia by moderate equivalent constriction of the aortas (with a silver wire) proximal to the points of origin of the renal arteries. The following hormones were given intramuscularly three times daily: amniotin in daily doses of 7,200 I.U. and 14,400 I.U., proluton in daily doses of 3 mgm and 6 mgm, eschatin in daily doses of 3 c cm and 6 c cm, follutein in daily doses of 500 R.U. and 1,000 R.U., and pitocin in daily doses of 30 and 60 O.U.

None of the animals receiving these preparations showed significant variations in the urine findings, blood-pressure levels, or histological changes in the liver and kidney, in comparison with animals in which equivalent aortic constriction had been performed. Animals receiving from 60 to 120 p.u. of pitressin showed albuminuria, depression of the blood pressure, and lesions of the kidney, liver, adrenal, myocardium, and gastric mucosa when subjected to comparable renal ischemia. The kidneys showed moderate cloudiness of the parenchymatous tissue, the glomeruli were normal, and occasionally a convoluted tubule containing a few hyalinized cells with pyknotic nuclei or a moderate amount of albumin was seen in the lumen. In the more seriously injured organs the convoluted tubules were converted into hyalinized semblances of the former tissue, the nuclei were absent, and the lumina obliterated. The livers of these animals frequently showed some cloudy swelling which on microscopic

examination proved to be focal and usually sharply outlined beginning in the peripheral one-third of the lobule and extending to the central vein. The liver cells in these areas are confluent masses of hyalinized material in which the nuclei were pyknotic and the sinusoids were either partially or completely obliterated.

While using approximately the same doses of pitressin in control animals in which aortic constriction was performed below the point of origin of the renal arteries, the authors observed similar blood pressure urines, and pathological changes.

They did not observe any synergistic effect of these preparations on the course of animals subjected to renal ischemia. RIZOV W. R. M.D.

Stark, W. Experiments on Rabbits with "Os Purum" and "Os Novum," Respectively by (Königchen emsch mit "Os purum" bzw. "Os novum")
63 T. 8 d. deutsch Ges. f. Chir. Berlin, 940

Experiments are reported on a series of 20 rabbits in which previously regenerated os purum and os novum respectively were transplanted. In the first series os purum grafts implanted in previous set partial or total gap in one of the two front leg bones and left there for about 15 weeks. In an identical gap on the left side an autoplasmic graft taken from the right side was implanted as control graft. Illustrations were taken immediately after implantation and after three and six months, respectively.

In the second series the method of the Swedish surgeon Örell was followed, and an os purum

graft was implanted for the purpose of creating an os novum under the periosteum of either the humerus or femur, or of the femur or ribs, respectively and left there for about eight to eleven weeks. A second operation consisted in transplanting the new, red, moist and soft osseous tissue formed around this graft, the actual os purum, to the right side, either alone or together with the os purum graft.

had been done in the first series. Like on the left side a topoplasmic graft placed for control or the defect as left to heal spontaneously. Roentgenograms were taken after the operation at the same intervals as indicated for the first series. Some roentgenogram taken before the second operation showed already after eight weeks the dark shadow of an osseous tissue between the os purum graft and the bone.

The roentgenograms and the experimental results proved that os purum heals less easily and more slowly than an autoplasmic bone graft. However, it heals and remains encased without being thrust off. Os novum appears to be the ideal osseous grafting material, which can be produced excellently by the transplantation of os purum under the periosteum. It heals and forms new bone in much less time than it could take for simple healing of the set osseous gap, which according to the illustrations also healed well. Os purum plus os novum also appears to heal more slowly than pure os novum alone. At times, however, cannot spare the mechanical effect produced by the simultaneous transplantation of bone graft.

(S. 122) HINZEL N. W. M.D.

3 While these lesions are of rare occurrence they are more frequent than previous reports would indicate.

Although papilloma is the commonest single diagnosis, the pigmented tumors comprise the largest group of tumors in this series (approximately 35 per cent).

3 The nomenclature of tumors in this area is hopelessly confused.

4 The preponderance of tumors of the lacrimal caruncle are benign, but a small proportion are malignant and display tendency toward recurrence and metastasis; any pigmented tumor must be regarded as at least potentially malignant.

5 There are no reliable criteria for accurate classification of benign and malignant tumors, especially those that are pigmented.

6 For the reasons stated, the prognosis in individual cases cannot be made with any degree of precision.

LESLIE L. MCCOY M.D.

Irvine R. Sympathetic Ophthalmia. A Clinical Review of 63 Cases. *Arch. Ophthalmol.* 940, 24 49.

In a series of 63 cases of sympathetic ophthalmia recorded in the Massachusetts Eye and Ear Infirmary between 1902 and 1935 there was no instance of development of the condition without perforation of the globe. This indicated that if enucleation is to prevent the development of sympathetic ophthalmia, it must be done before two weeks have elapsed from the time of injury. Once sympathetic ophthalmia has developed, enucleation of the exciting eye has no effect on the course of the disease and this eye should be retained, if potentially useful, as it may eventually be the better eye.

Sympathetic ophthalmia, as found to occur in about 1 per cent of all perforating injuries, is a fact that fails to justify retention of severely damaged eye. The possibility of sympathetic ophthalmia must be remembered when operation is contemplated on eyes that are nearly blind.

It was found that the exciting eye is always irritable at the onset of the symptoms in the sympathizing eye and keratic precipitates were nearly always present in the sympathizing eye often before they appeared in the exciting eye.

The wounds which excite sympathetic ophthalmia, whether traumatic or operative, characteristically show incarcerated lens substance or uveal tissue. This observation is of significance in the repair of perforating injuries. WILLIAM A. MARY M.D.

Howard, W. H. Corneal Transplantation. *Arch. Ophthalmol.* 940, 24 38.

The author relates in quite some detail the results of his experimental work, the theoretical considerations involved, the types of technique used, and his final observations. His studies led him to the opinion that an effective simplified technique should be the goal for the work of corneal transplantation.

After careful study of the comparison of the edges of the recipient cornea and the donor graft he

calls attention to the following factors which should be considered:

1 Comparative thicknesses—local and general, and pre-operative and postoperative—of the corresponding individual layers of the two corneal tissues.

2 Radius of curvature of the two thinnest.

3 Corneal astigmatism—preexisting and newly formed.

4 Comparative measurement between the periphery and the donor graft, with allowance for slight uniform reduction in the size of the graft.

5 Degree of linear regularity of the incised edges.

6 Uniformity in the depth of the primary incisions.

7 Symmetry of the beveled posterior corneal tissues.

8 Comparative positions of the edges of the tissue along the entire length of the wound.

It is structurally impossible to produce an accurate apposition of the separate layers of the host and donor corneal tissues. What is obtained is mere approximation. However the nearer one approaches true apposition the greater are the chances for successful operation.

A theoretical comparison is made of the operative procedures with the trephine blades and the keratome, the tomatic trephine, and the hand trephine. While there is obvious merit in all of the three methods, the hand-trephine technique is recommended because it embraces the necessary elements toward which the future development of corneal transplantation should be directed. Likewise it should be more suitable for the needs of the majority of ophthalmological surgeons. Accurate comparison in the last analysis, however, must rest with those having the opportunity for considerable actual experience.

An improved trephine for stabilizing corneal trephine is presented.

Observations relating to operative technique are made including the description of simplified cross suture.

Obviously further experimental work is needed and should be encouraged. LESLIE L. MCCOY M.D.

Beecham, W. P. Atopic Cataracts. *Arch. Ophthalmol.* 940, 24.

Atopy, a term coined by Coca to describe the occurrence of eczema, asthma, hay fever and fibrosclerosis of the skin in young persons with constitutional predisposition to hypersensitivity, must include cataract formation as an uncommon addition to the syndrome.

Ten cases of topical cataract are reported in detail. On occasions intradermal tests with avirulent aqueous are performed with negative result. Histological examination of the lens in instances showed cortical degeneration and normal capsule. The roles of infection, vitamin-B₂ deficiency, of the endocrine glands, and disturbance of the autonomic nervous system as causative factors in

the production of these cataracts have been considered but the author inclines toward an allergic basis

WILLIAM A MANN, M D

Torres Estrada, A Non-Surgical Treatment of Detachment of the Retina (Tratamiento no quirurgico del despegamiento de la retina) *Bol d hosp ofcal de Ntra Sra de la Luz*, 1940, 1 45

The author supplements the conservative treatment of detachment of the retina, consisting of rest and subconjunctival injections, by compressing the involved eye with a special apparatus. This apparatus is removed only for the purpose of the daily instillation of atropine. In 4 cases very satisfactory results were obtained.

JOSEPH K. NARAT, M D

EAR

Goldberg, S. A. Gangrene and Infection of the Ear, Nose, and Throat Complicating Diabetes Mellitus. A Review of Clinical Manifestations with Surgical Considerations and Report of a Case. *Arch Otolaryngol*, 1940, 32 16

A case of diabetes mellitus associated with gangrene of the intranasal structures, in which recovery occurred, is reported by Goldberg. The author also reviews the literature and discusses the clinical manifestations and surgical considerations. The reported case demonstrates the close association between gangrene and infection, the extension of the infection from the soft tissues to the osseous structures by contiguity, and the production of acute localized osteomyelitis, as well as the spread of infection to the vascular channels, resulting in arteritis, phlebitis, thrombosis, occlusion, and gangrene. The literature shows that the delayed healing of wounds is the result of changes in the vascular structures and of poor defensive mechanism. The importance of the rôle of the latter factor was substantiated in the reported case by the poor cellular reaction, the patient showing relative or absolute leucopenia during hospitalization.

Gangrene limited to the intranasal structures is not invariably fatal. In this respect the lesion in that area is in contrast to one occurring on the superficial aspect of the face and cheeks, where the abundant vascular supply facilitates the spread to the venous channels and produces cavernous sinus thrombosis or to the systemic circulation and produces septicemia or metastatic abscesses.

The prognosis is dependent on many factors, for example, the type of infection, location of the primary lesion, status of the vascular supply, general condition of the patient, and, finally, intelligent conservative treatment.

NOAH D. FABRICANT, M D

Bowers, W. C. Observations on 793 Cases of Acute Purulent Otitis Media, with Chemotherapy in 396 Cases. *J Am M Ass*, 1940, 115 178

Bowers analyzes a series of 793 cases of acute purulent otitis media. In 599 recovery occurred without operation, and of this number 231 cases

were selected because of their short duration and because myringotomy could be performed in the hospital, where the condition of the ears could be observed daily until the discharge ceased. The average duration of the discharge in the 113 cases in which chemotherapy was received was nine days, in the 118 in which it was not received the duration of the discharge averaged seventeen days. According to the author, it appears that chemotherapy reduced the duration of the discharge by about 50 per cent and increased the number of recoveries from 67 to 81 per cent.

Mastoidectomy was performed in 194 (24 per cent) of the 793 cases of acute purulent otitis media in the hospital. In 387 cases the ear condition was of not more than a few days' duration, in 207 of these the condition was treated with sulfanilamide chemotherapy, and in 12 (5.7 per cent) mastoidectomy was necessary, in 180 the condition was not treated by these methods, and of these 24 (11 per cent) came to mastoidectomy.

As a result of his experience in the treatment of this series of cases, the author arrives at the following conclusions:

If chemotherapy is given early, before bone destruction occurs, the duration of discharge is diminished by about 50 per cent and the number of mastoidectomies is diminished by about 50 per cent. When the clinical picture strongly indicates mastoidectomy, it is safer to operate. After uncomplicated mastoidectomy, it is better not to give the drug. Complicated mastoiditis requires intensive chemotherapy. Occasionally it is necessary to stop administration of the drug in order to obtain a true picture, since sulfanilamide cures the middle ear while progressive bone destruction may take place in the mastoid.

Chemotherapy has unquestionably added greatly to the confidence of physicians in their ability to conquer acute otitis media and mastoiditis. They have always been apprehensive of meningitis as long as the ear continued to discharge. The mortality has dropped from 97 to 35 per cent. This is a great comfort and a signal achievement. Yet one should always remember that sulfanilamide may so obscure the clinical picture that there is danger of the unheralded sudden onset of grave complications, such as meningitis, and that all the symptoms of mastoiditis may disappear under the influence of this drug, while the lesion is actually spreading.

NOAH D. FABRICANT, M D

Rosenwasser, H. Neoplasms Involving the Middle Ear. *Arch Otolaryngol*, 1940, 32 38

At the present time it is believed that for neoplasms involving the middle ear and mastoid bone the combination of radical surgery and irradiation offers a much better prognosis than any of the earlier methods of treatment. Rosenwasser presents 4 cases involving the middle ear, notably a carcinoma, an adenocarcinoma, a fibrosarcoma, and a neurofibroma. In but 2 of the 4 cases, those of the carci-

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Kumath, C. A. The Problem of Carcinoma of the Breast: Radical Mastectomy in 98 Cases. *Arch. Surg.* 92:4 66.

The author reports a study of patients with carcinoma of the breast admitted to the University of Iowa Hospitals between 1927 and 1933. Of the patients in this series, 38 per cent were considered inoperable when first seen. When this 38 per cent is added to the deaths of the surgically treated cases, the five year survival drops from 50.5 per cent to about 30 per cent.

The criteria of inoperability at the clinic from which this report originates are those generally accepted: (1) demonstrable metastases to the skeletal system or other remote organs; (2) demonstrable involvement of the supraclavicular lymph nodes; (3) a far advanced ulcerative condition, or marked fixation to the chest wall; (4) very poor general condition or associated lesions making the prognosis for life limited; and (5) rapidly growing so-called acute carcinomas arising in the lactating breast or during pregnancy.

The 60 cases operated upon have been carefully analyzed by the author. The average age of the patients was fifty-two and one half years, the oldest patient being seventy four years and the youngest twenty-four years of age. The time that elapsed between the first symptom of trouble and the first visit to the physician varied from one day to twenty years, the usual delay being from six to eighteen months.

There was history of preceding trauma in only 1 per cent of the cases.

The first symptom most often noted was a mass in the breast (84.4 per cent). The symptom second in frequency was pain (8 per cent). Discharge was noted from the nipple in 3.3 per cent of the cases, but bloody discharge was noted only 4 times.

The lesion occurred most frequently in the upper and outer quadrant of the breast. It was in the upper half of the breast 3 times as frequently as in the lower half and the lateral half as involved almost 3 times as often as the medial half.

The interesting observation on axillary metastases also that in 4 cases clinical findings of axillary metastases are recorded, but such metastases were found in histological section in only 30 cases, an error of 7 per cent. In 49 cases no nodes were palpable clinically and metastases were demonstrated histologically in 30 of these specimens, an error of 4 per cent.

The operative technique was that of radical mastectomy. Primary closure was done in 87.5 per cent of the cases. There was no operative mortality. In this series no pre-operative radiation therapy was used, procedure now employed by the

author. Most of the patients received postoperative ray therapy. Infection was the most common post-operative complication, it occurred in 30 per cent of the cases. Edema of the arm occurred in 10 per cent of the cases.

Every one of the 60 cases operated upon was followed up by the author. The incidence of local recurrence was 8.0 per cent. Metastases occurred in more than half of the cases. Since most of the patients died at home, autopsies were not often done thus these figures are not accurate. In the cases closed by a skin graft the local recurrence was extremely high 47.3 per cent as compared to 17.7 per cent when primary closure was done.

The most important factors for the prognosis are age, lactation, rate of growth, and extent of the disease. The location of the lesion did not affect the prognosis in this series. EARL O. LAYMAN, M.D.

TRACHEA, LUNGS, AND PLEURA

Taffel, M. The Repair of Tracheal and Bronchial Defects with Free Fascia Grafts. *Surgery* 92: 8 36.

Four series of experiments were carried out on 20 dogs.

In the first group, full thickness segment on square was removed from the trachea of the animals and the defect closed with a free patch of cervical fascia. Then at intervals from one to eight weeks the dogs were sacrificed for examination. After four weeks there seemed to be complete regeneration of the epithelium and no traces of the original graft were left. Well differentiated adult connective tissue filled the former gap.

In the second series segment 5 cm. by 5 cm. was excised from the main left upper-lobe bronchus and bridged with free flap of deep fascia removed from the chest wall.

In the third series of experiments closure of the left upper-lobe bronchus was made after lobectomy.

In the last series the left lung was removed, no bronchial stump being left. The tracheal defect was then closed with deep thoracic fascia.

In all of the experiments black silk was used for the suturing material.

All of the animals survived the operative procedures and there were no instances of subcutaneous emphysema, pneumothorax, hydrothorax, or pleural empyema, no complications or parenchymal lesions could be detected at any time.

The healing process followed essentially the same pattern, whether the defect was in the trachea or bronchus. The graft did not act as a temporary and artificial but acted as a permanent and replaced as quickly invaded and replaced by cells and proliferating fibroblasts. The respiratory mucosa was

the production of these cataracts have been considered but the author inclines toward an allergic basis
WILLIAM A MANN, M D

Torres Estrada, A Non-Surgical Treatment of Detachment of the Retina (Tratamiento no quirurgico del despegamiento de la retina) *Bol d hosp oftal de Ntra Sra de la Luz*, 1940, 1 45

The author supplements the conservative treatment of detachment of the retina, consisting of rest and subconjunctival injections, by compressing the involved eye with a special apparatus. This apparatus is removed only for the purpose of the daily instillation of atropine. In 4 cases very satisfactory results were obtained
JOSEPH K NARAT, M D

EAR

Goldberg, S A Gangrene and Infection of the Ear, Nose, and Throat Complicating Diabetes Mellitus. A Review of Clinical Manifestations with Surgical Considerations and Report of a Case *Arch Otolaryngol*, 1940, 32 16

A case of diabetes mellitus associated with gangrene of the intranasal structures, in which recovery occurred, is reported by Goldberg. The author also reviews the literature and discusses the clinical manifestations and surgical considerations. The reported case demonstrates the close association between gangrene and infection, the extension of the infection from the soft tissues to the osseous structures by contiguity, and the production of acute localized osteomyelitis, as well as the spread of infection to the vascular channels, resulting in arteritis, phlebitis, thrombosis, occlusion, and gangrene. The literature shows that the delayed healing of wounds is the result of changes in the vascular structures and of poor defensive mechanism. The importance of the rôle of the latter factor was substantiated in the reported case by the poor cellular reaction, the patient showing relative or absolute leucopenia during hospitalization.

Gangrene limited to the intranasal structures is not invariably fatal. In this respect the lesion in that area is in contrast to one occurring on the superficial aspect of the face and cheeks, where the abundant vascular supply facilitates the spread to the venous channels and produces cavernous sinus thrombosis, or to the systemic circulation and produces septicemia or metastatic abscesses.

The prognosis is dependent on many factors, for example, the type of infection, location of the primary lesion, status of the vascular supply, general condition of the patient, and, finally, intelligent conservative treatment
NOAH D FABRICANT, M D

Bowers, W C Observations on 793 Cases of Acute Purulent Otitis Media, with Chemotherapy in 396 Cases *J Am M Ass*, 1940, 115 178

Bowers analyzes a series of 793 cases of acute purulent otitis media. In 599 recovery occurred without operation, and of this number 231 cases

were selected because of their short duration and because myringotomy could be performed in the hospital, where the condition of the ears could be observed daily until the discharge ceased. The average duration of the discharge in the 113 cases in which chemotherapy was received was nine days, in the 118 in which it was not received the duration of the discharge averaged seventeen days. According to the author, it appears that chemotherapy reduced the duration of the discharge by about 50 per cent and increased the number of recoveries from 67 to 81 per cent.

Mastoidectomy was performed in 194 (24 per cent) of the 793 cases of acute purulent otitis media in the hospital. In 387 cases the ear condition was of not more than a few days' duration, in 207 of these the condition was treated with sulfanilamide chemotherapy, and in 12 (5.7 per cent) mastoidectomy was necessary, in 180 the condition was not treated by these methods, and of these 24 (11 per cent) came to mastoidectomy.

As a result of his experience in the treatment of this series of cases, the author arrives at the following conclusions:

If chemotherapy is given early, before bone destruction occurs, the duration of discharge is diminished by about 50 per cent and the number of mastoidectomies is diminished by about 50 per cent. When the clinical picture strongly indicates mastoidectomy, it is safer to operate. After uncomplicated mastoidectomy, it is better not to give the drug. Complicated mastoiditis requires intensive chemotherapy. Occasionally it is necessary to stop administration of the drug in order to obtain a true picture, since sulfanilamide cures the middle ear while progressive bone destruction may take place in the mastoid.

Chemotherapy has unquestionably added greatly to the confidence of physicians in their ability to conquer acute otitis media and mastoiditis. They have always been apprehensive of meningitis as long as the ear continued to discharge. The mortality has dropped from 97 to 35 per cent. This is a great comfort and a signal achievement. Yet one should always remember that sulfanilamide may so obscure the clinical picture that there is danger of the unheralded sudden onset of grave complications, such as meningitis, and that all the symptoms of mastoiditis may disappear under the influence of this drug, while the lesion is actually spreading.

NOAH D FABRICANT, M D

Rosenwasser, H Neoplasms Involving the Middle Ear *Arch Otolaryngol*, 1940, 32 38

At the present time it is believed that for neoplasms involving the middle ear and mastoid bone the combination of radical surgery and irradiation offers a much better prognosis than any of the earlier methods of treatment. Rosenwasser presents 4 cases involving the middle ear, notably a carcinoma, an adenocarcinoma, a fibrosarcoma, and a neurofibroma. In but 2 of the 4 cases, those of the carci-

noma and the neurofibroma, was there history of prolonged suppuration of the middle ear. In all 4 cases, however paralysis or pain of the facial nerve was a present sign on admission to the hospital.

The futility of any form of treatment of advanced malignant growths as demonstrated by the first case in which the tumor a squamous-cell carcinoma, had already extended into the substance of the temporal lobe, and by the second case, in which the tumor an adenocarcinoma, had extensively invaded the temporomandibular joint and the zygoma. As general rule one ought to regard as potentially malignant all growths situated deep in the external auditory canal, regardless of whether they are associated with bloody discharge, pain, or paralysis of the facial nerve. Results of one biopsy if negative do not exclude the possibility of a malignant growth.

In a patient with known chronic suppuration of the middle ear associated with polyps superimposed malignant growth may develop at any period of the infection. The onset of pain, paralysis of the facial nerve or bloody discharge in chronic suppuration of the middle ear should make one suspect neoplasm. At present it is the consensus that radical electrocoagulation combined with intensive external drainage is the treatment of choice for neoplasms arising in the middle ear.

NOAH D. FAIRCART, M.D.

PHARYNX

Swissbühl G. Keratosis Pharyngis. *J. Laryngol. & Otol.* 1949, 55, 752.

Keratosis pharyngis is an affection of the epithelium associated with the lymphoid tissue found in that region known as Waldeyer's ring which includes the pharyngeal tonsil, the palatine tonsil, the lingual tonsil, the so-called lateral pharyngeal bands, and any outlying lesser collection of lymphoid tissue in the nasopharynx, oropharynx, or hypopharynx rarely it even affects the lymphoid tissue lying in the region of the vocal cords of the larynx.

The condition is characterized by the presence of yellowish white outgrowths which may take many forms sometimes they appear as horn-like projections of varying lengths up to 5 mm. Longer ones are seen occasionally in sheltered positions. Less commonly they may appear as plaques, on the surface of the otherwise normal looking mucous membrane or they may be seen in crypts. They are as a rule painless and are usually discovered accidentally. Once discovered by the patient, they are prone to give rise to varying degrees of irritation the most common complaint being pricking or tickling sensation.

Local treatment with drugs by means of gargles and paints seems to have little effect, and may even prolong the duration of the condition. If the horny outgrowths are confined to the tonsil and are worrying the patient it would seem justifiable to perform

tonsillectomy especially if the tonsils are also the seat of chronic lacunar tonsillitis, as is nearly always the case on theoretical grounds the removal of the cause of the metaplasia, usually the tonsil, would be indicated. Any other obvious focal sepsis in the mouth, pharynx, or nasal accessory sinuses should be eradicated. General tonic treatment, although treatment as described would seem to offer the earliest chance for the disappearance of the keratosis.

NOAH D. FAIRCART, M.D.

NECK

Meyers, E. S.: The Deep Cervical Fascia and Its Relation to Suppuration. *University of Queensland P. pers. Faculty of Medicine*, 1949, 1.

An attempt has been made to simplify the concept of the fascias of the neck. This has been attempted by simplification of the fundamental anatomy of the neck. Schematic representation of the structures involved with the deep cervical fascia is very simply presented. Four types of fascial sheaths are explained (1) those enclosing muscles (2) those enclosing blood vessels, (3) those enclosing food and air passages and (4) those formed by utilization of portions of the fascia of these three types such as lateral pharyngeal, retrovisceral, submaxillary and thyrolopharyngeal fascias.

An intricate anatomical explanation is presented which is especially concerned with the continuity of the fascias. The pathology as well as the clinical aspects of the fascias are also discussed. Suppuration in the neck following infection in the tonsil and in the retrovisceral space is taken up in detail.

ROCKLAND J. BREWSTER, J. M.D.

Figl F. A. Chronic Stenosis of the Larynx. Its Special Consideration of Skin Grafting. *Ann. Otol. Rhinol. & Laryngol.* 1949, 49, 994.

Treatment for chronic stenosis of the larynx should be delayed until the patient is in the best possible general condition and until any local inflammatory reaction has entirely cleared. The type of treatment indicated in a given instance depends largely on the character and extent of the stenosis rather than on its cause. Boogie's method, the most commonly employed procedure in the treatment of stenosis of the larynx, has in our experience at the Mayo Clinic been one of the least effective procedures. Elastic pressure applied by means of soft rubber dilators is one of the most satisfactory methods of treatment for stenosis. Laryngotomy with excision of the scar and any thickened or distorted cartilage followed by skin grafting, is the most effective method of dealing with chronic stenosis and often will restore a satisfactory laryngeal lumen after other methods have failed.

Bernheimer L. B. Carcinoma of the Larynx. *Ann. Otol. Rhinol. & Laryngol.* 1949, 49, 4 B.

The treatment of intrinsic laryngeal carcinoma usually yields excellent end-results. It is reported

that 60 per cent of the patients with lesions requiring total laryngectomy and 80 per cent with the more superficial ones amenable to laryngofissure are living and well after five-year periods. On the other hand, the treatment of extrinsic carcinoma of the larynx is most discouraging, five-year cures being the exception, and, unfortunately, a very large number of laryngeal neoplasms fall into this group.

One hundred cases of extrinsic laryngeal carcinoma have been reviewed and an attempt has been made to establish why primary intrinsic disease became secondary extrinsic disease. Four factors were found to be common denominators and, in the order of their importance, they were

- 1 Failure of the patient to realize the significance of persistent aphonia

- 2 Failure of the physician to recognize early, obvious pathology

- 3 The overhanging, infantile type of epiglottis. This type of epiglottis obscured indirect view of the anterior commissure and, as direct examination had

not been undertaken, small, intrinsic, anterior commissure lesions had not been discovered until extralaryngeal structures were involved.

- 4 Subglottic growth. Again direct laryngoscopy had not been performed and lesions which might have been amenable to laryngeal surgery became inoperable because they were hidden below the vocal cords and had escaped detection by indirect examination.

The end-results of 31 surgically treated intrinsic carcinomas of the larynx have been reported. In this group 13 of the 14 patients who were treated by laryngofissure with cordectomy survived without evidence of disease for periods varying from nine months to eleven years. Two with hemilaryngectomies are also alive and well after one year and seven months, and two years and four months. Eleven of the 15 patients undergoing total laryngectomy have survived without recurrences for periods extending from eight months to two years.

JOSEPH K. NARAT, M.D.



SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS CRANIAL NERVES

Meredith, J. M. The Management of Head Injuries. *West Virginia M. J.* 940 36 20

The author of this article has briefly discussed most of the accepted, common sense, practical rules for the management of acute craniocerebral injuries.

Careful, terse unhurried examination of the entire patient as well as of the local injury is stressed. So-called "minor" concussions are not to be treated lightly but the patient must be hospitalized until all doubt as to the presence of severe injury is cleared. A lumbar puncture is not necessary in more than 5 per cent of all cases. It may indeed be dangerous, and it does little good with regard to either removing erythrocytes or permanently reducing the pressure. A bitemporal decompression is a fast-disappearing practice. When operation for a bleeding middle meningeal artery depressed fracture, or large clot is necessary early operation, measures to counteract shock, and blood transfusion are factors of prime importance.

The author concludes that additional bodily injury is a major complication, important to the prognosis, and he finds that "the patient with severe associated injury (regardless of the type of head injury) is five times more likely to be in shock than is the patient without associated injury. Though the state of shock is the main index to the severity of the patient condition, deep shock should never deter the surgeon from operating if operation is obviously necessary. To delay may mean the early death of the patient or the development of severe intracranial infection.

Four interesting case histories add to the instructional value of this article. JOHN MARTIN, M.D.

Coeville, C. B. and Blomquist, O. A. Traumatic Intracerebral Hemorrhage with Particular Reference to Its Pathogenesis and Its Relation to Delayed Traumatic Apoplexy. *Arch Surg* 940, 4

This article should be of great interest to general surgeons, neurosurgeons and pathologists because it discusses at some length the question of traumatic intracerebral hemorrhage. The medicolegal problem of delayed traumatic apoplexy is also considered. For this purpose the records of 439 cases of fatal head injuries are studied and among them 36 cases of gross intracerebral hemorrhage were discovered. Ten additional cases were also described. In these cases the patients had previously been examined clinically on neurosurgical service.

The cases of intracerebral hemorrhage are divided into those due to direct injury and those due to coup-countercoup injury. Direct injury as regarded as

being due to laceration of the brain from driven fragments of bone there are 3 cases in this group, 2 of which were old ones. The remaining, much larger group was that mainly under discussion. The coup-countercoup hemorrhages were further described according to whether they rose in the centrum of the white matter or whether they were mere inward extensions of cortical hemorrhage or laceration. The former were classified as central and the latter as adjacent. The writers are quite emphatic in stating that the coup-countercoup injuries occur only with the head in motion and that it is only in this type of injury that the intracerebral hemorrhage occurs.

A very careful study was made as to the anatomical location of these hemorrhages with regard to the various lobes. The mechanism of their production is also discussed. Tables are provided which record important findings in detail. Traumatic hemorrhage occurred into the frontal lobes 3 times, into the temporal lobes 13 times, and into the ganglionic region (external capsule and lenticular nucleus) 7 times. From the clinical standpoint these hemorrhages may assume significance after several days, although the patient may survive for considerable time and in this respect there may be confusion with subdural hematomata.

Following this study the question of delayed traumatic apoplexy" as brought up to see if any light could be shed upon it. This vague term, though its medicolegal implications, has been in use for fifty years. The history of the term and the various ingenious theories devised to support it are discussed, but most important is the criteria laid down for its acceptance. Traumatic hemorrhage occurs principally in the frontal and temporal lobes. It is usually slight in the region of the basal ganglia. When it is found in this location it usually involves the external capsule; no case has been reported of hemorrhage in the internal capsule. The hemorrhages occur in the young as well as the old, and other signs of injury to the brain are almost invariably present. Spontaneous hemorrhage in cases of arteriosclerosis and hypertension show quite different pathological picture. Arteriosclerosis and syphilis do not seem to play an important part in traumatic hemorrhage into the brain. Hypoplasia of the arteries may play minor rôle.

Certain postulates should be laid down in cases of presumed traumatic hemorrhage.

The injury to the head must be severe enough to cause direct injury to the intracranial content.

2. The vascular system must be sound before injury.

3. Evidence of commotio cerebri and its consequences must lead directly to the apoplectic stroke.

4. Clinical objective signs of changes in the brain must be perfectly evident.

5 The interval between the development of the hemorrhage and the injury should not be less than one day or greater than eight weeks

ADRIEN VERBRUGGHE, M D

Collier, J Facial Paralysis and Its Operative Treatment *Lancet*, 1940, 239 91

In a discussion of the treatment of injuries of the facial nerve, such as occur after a radical mastoid operation, Collier stresses the fact that if the facial weakness is delayed, appearing one or more days after operation, it is wise to postpone operation in the hope that spontaneous recovery will occur. This is true especially if the electrical responses are normal. Such delayed paresis is frequently due to a temporary postoperative edema of the nerve within the narrow confines of the bony facial canal. However, if the paralysis is immediate and complete, early operation is indicated to innervate the muscles as quickly as possible to avoid their fibrosis and eventual mass movements of the face. Old cases of long-standing paralysis with a negative response to galvanic testing offer little hope of recovery, for regressive changes have generally occurred in the pontine facial nucleus and the facial area of the rolandic cortex.

Suture of graft material (usually the medial femoral cutaneous nerve) within the facial canal is not feasible, and scar formation at the suture or approximation site is especially to be avoided. Best results have been obtained from "prepared" (degenerated nerve) graft material which is firm and stiff enough to be cut squarely across the ends and to maintain its position when it is laid in accurate approximation to the ends of the facial nerve in the canal.

Following the placing of the graft and during the time of recovery, splinting of the facial muscles and well directed physical therapy in the form of massage are very important for the maintenance of good muscle tone. Individual facial movements are attained through personal effort and training, and not through the aid of galvanic stimulation which, rather, favors the development of tics.

JOHN MARTIN, M D

Hoover, W B, and Poppen, J L Surgical Repair of the Seventh Cranial or Facial Nerve for Facial Paralysis *Surg Clin North Am*, 1940, 20 685

This is a short, explicit contribution on the surgical treatment of facial nerve palsy. It includes not only the treatment of paralysis caused by section of the nerve in operations for mastoid disease and in the removal of acoustic neuromas, but also the surgical treatment of the paralysis of Bell's palsy.

In the case of accidental section of the nerve during operations on the mastoid, or interruption of the nerve by inflammatory products in mastoid disease, the authors follow very closely the technique suggested some time ago by Ballance and Duel in a nerve-graft operation.

In order to completely remove an acoustic tumor, it is nearly always necessary to divide the facial nerve, and this article shows very clearly the anatomy involved and the surgical procedure that is necessary to produce a spinofacial anastomosis. The authors suggest that the descending branch of the hypoglossal nerve be used for anastomosis to the distal end of the spinal accessory nerve.

Emphasis is laid on the necessity of practice of movements in front of a mirror on the part of the patients in order to obtain control of the facial musculature.

ADRIEN VERBRUGGHE, M D

PERIPHERAL NERVES

Cairns, H, and Young, J Z The Treatment of Gunshot Wounds of the Peripheral Nerves *Lancet*, 1940, 239 123

This study of gunshot wounds of peripheral nerves is based on reports from the World War and on experimental work. Nerve injuries of war differ from those of peace in that in the former immediate suture of a divided nerve is almost never possible because of infection. Bad results after nerve suture in septic wounds are believed to be due to intense connective-tissue formation which provides a barrier to regenerating nerve fibers. Immediate suture is always desirable but has rarely been possible in war. With modern chemotherapy this situation might be altered. World War experience showed the difficulty of determining the extent of permanent damage to nerves in war wounds. Many of the nerve lesions were due to contusion rather than to severance of the fibers and the changes were reversible, so that a high percentage of spontaneous recoveries occurred. This suggests the advisability of a waiting period before reparative surgery is undertaken. Opinions concerning the optimum time to wait for spontaneous recovery vary from two months to a longer interval of four or six months. In nerve suture after seven months, success was less frequent than after a shorter waiting period. Most cases of satisfactory spontaneous recovery showed some signs of recovery within six months. Recognition of early signs of regeneration depends on periodic sensory and electrical examination by a trained observer. Knowledge of trick movements, electrical reactions, and variations in motor and sensory supply is essential.

The question of exploration after the healing of the initial wound depends on the clinical progress indicated by repeated examination and on the elapsed time. It is not known whether the power of regeneration persists indefinitely in the central stump, nor whether the peripheral stump is at all times equally able to receive new fibers. Experiences of the last war indicate that peripheral conditions of the stump, end organs, and muscles are important. In practice the chance of successful recovery is good only when suture is performed within eighteen months after injury, although recovery after much longer periods has been reported. Foerster believes

that early operation does not give a more complete recovery than late operation although it may shorten the period of disability. On the other hand, histological examination of resected material during the World War indicated that many nerves subjected to early resection and suture probably could have recovered spontaneously.

Tensive physical therapy is important in all cases and for the success of nerve suture should be continued without interruption for a year or more after operation. The modalities are splinting and movements to prevent contractures, warmth through clothing, heat, and massage and expert electrical stimulation of paralyzed muscles. The stage of recovery voluntary exercise for reeducation of the paralyzed limb supersedes all other therapeutic measures. Psychotherapy is essential throughout.

All operative procedures entail freeing the nerve from scar tissue. In the event that there is no loss of anatomical continuity of the nerve, either neurolysis or resection and suture may be performed. The procedure to be followed will depend upon (1) the macroscopic appearance (2) the response to faradic stimulation or to the more easily controlled thyatron discharge (it must be borne in mind that electrical stimulation will not elicit a response from regenerating fibers not yet reaching motor end organs) and (3) the demonstration of growing fibers distal to the site of injury by the oesitograph. Some of the unanswered problems which tax surgical judgment are: (1) the extent to which nerve fibers grow through scar tissue and end bulbs (2) the macroscopic changes that take place in the distal stump when nerve fibers grow into it and (3) the extent of proximal resection necessary to obtain healthy fibers, especially in cases of extensive proximal intraneural fibrosis.

In the operation of external neurolysis the nerve sheath is freed from scar tissue and replaced in healthy bed with or without wrapping. Contrary to the fears of Leriche results suggest little risk of ischemia if the nerve is handled gently. Fascia lata should not be used for wrapping because it may contract on the nerve. Fresh or alcoholized Cargile membrane, thin sheets of gutta percha, or amniotic membrane may be used, but fat grafts require further investigation.

Resection and end-to-end suture may be very difficult and time consuming. Although some have believed it unnecessary to resect end bulbs histological evidence suggests that an end bulb, or neuroma, prevents the passage of fibers between the central and peripheral stumps in sufficient numbers to produce functional recovery. Nerves do not stretch easily and tension should be avoided. Attempts at stretching may cause intraneural hemorrhages and scar formation in the proximal trunk, although some believe that nerve stretching is less unfavorable. Reducing gaps by limb posture with gradual straightening may result in extensive fibrosis. In certain nerves gaps can be bridged by transposing the nerve into a shorter course. Opinions

concerning the importance of fascicular position vary. Evidence that sensory or motor end organs specifically attract their appropriate fibers is lacking. The number of regenerating fibers and branches growing into the peripheral stump appears to be the measure of recovery. In mixed nerves the chance of recovery is smaller because fewer fibers return to the appropriate muscles. Because of the complex changing intraneural pattern of fibers correct fascicular apposition may be impossible if considerable length has been resected. Therefore like rotation of the stumps should be avoided, there is no reason to make a fetish of this point.

The best method of tabulating the end-results of nerve injuries is probably that of Stoyford, who recorded recovery in terms of each paralyzed muscle and of sensibility. JOHN L. LUDGATE, M.D.

Young, J. Z., and Medawar, P. B. Fibrin Suture of Peripheral Nerves. Measurement of the Rate of Regeneration. *Lancet*, 1940, 39, 36.

To simplify nerve suture and to minimize the disorganization of the fibers apt to be produced by stitches the authors have devised a method by which stumps can be held together with concentrated coagulated blood plasma. The epineurium of both stumps is gripped and fixed with forceps, and plasma freshly mixed with strong tissue extract is poured around the stumps. In from one-half to two minutes the plasma dries to a firm jelly which seals to the nerves and holds the stumps together. Little or no plasma penetrates between the stumps to establish a barrier to regeneration. The plasma is permeable and dissolves a clot in three weeks but remains long enough for firm union to be established. A method of increasing the strength of the plasma by dissolving fibrinogen is described.

The experiments are performed on rabbits and dogs. Fibrin suture of the dog's sciatic nerve was a severe test because of the animal's postoperative activity, but satisfactory results are obtained with the rabbit sciatic nerve even when the cut ends are 1 cm. or more apart. Histological study showed that the junction made by the plasma method is as readily crossed by nerve fibers and that the fibers grew with fewer deviations and kinks than in controls sutured with fine silk.

Comparative studies on the rate of regeneration with fibrin junction and with suturing suggest that the fibers cross the junction more readily with the former. In measuring the rate of regeneration the authors exposed the nerves under light anesthesia and measured the distance peripheral from the junction at which pinching or electrical stimulation would elicit reflex response. They calculate the time of expected recovery on a basis of ten days (or more with complications) for crossing the scar and 4 mm. per day growth in the peripheral stump. They conclude that the fibrin method provides better junctions than suture in addition to having the advantages of ease and rapidity of execution.

JOHN L. LUDGATE, M.D.

Young J Z, Holmes, W, and Sanders, F K
Nerve Regeneration Importance of the Peripheral Stump and the Value of Nerve Grafts
Lancet, 1940, 239 128

The part played by the peripheral stump in nerve regeneration is uncertain and yet knowledge of peripheral conditions is important in considering nerve-suture or nerve-graft operations. It is known that the Schwann cells in both stumps multiply after section and in the peripheral stump they form Schwann bands or bands of Bungner. The exact relationship between these bands and the outgrowing axons from the central stump is unknown. Further, it is not known whether the peripheral stump is equally able to receive new fibers at all times, or whether activity of the Schwann cells is essential to nerve regeneration.

Animal experiments show that the peripheral stump plays an important part in making the actual junction between the cut ends. When gaps are left between the ends the proliferating Schwann cells of the peripheral stump form strands of tissue which grow centrally across the gap to join with similar growths from the central stump. This forms a bridge for the passage of outgrowing axons. Measurements of the rates of outgrowth suggest that the peripheral contribution is more rapid and of greater extent than the central, and that the rate of growth is increased when the stumps lie close together. The rapidity of growth of the Schwann cells from the peripheral stump suggests a reversed neurotropism,

but the authors believe that if such a factor exists it operates only over a distance of a few millimeters. Further they found that peripheral outgrowths would not turn toward the central stump if they were not already connected with it. It is not known how much the process of peripheral nerve regeneration of human nerves but it appears that small gaps can be bridged in this way. The process of regeneration through such peripheral growths of nerve may be impaired in the case of the new axons into proper paths as effective as in a true peripheral stump.

Comparative experiments were made with three types of nerve transplants. Autografts, the rabbit nerve were used to fill gaps in the peripheral nerve. The rabbit. Predegenerated autografts, and also homografts, stored homografts and also allografts were also used. These comparative experiments showed that a fresh autograft is a better medium for growth only slightly less than a normal peripheral stump. The authors did not, however attempt to measure the extent to which new fibers reached appropriate end-organs. Fresh autografts are likely to produce a more successful result and the trouble of producing nerve regeneration does not seem worth while. The use of homografts for a short period of time may yet be excluded as worthless. In the experiments of the authors, alcohol fixed grafts were found to be poor vehicles for new fibers.

JOHN L. LEE, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Kumath, C. A. The Problem of Carcinoma of the Breast Radical Mastectomy in 90 Cases. *Arch Surg* 910 4 66.

The author reports a study of patients with carcinoma of the breast admitted to the University of Iowa Hospitals between 1917 and 1933. Of the patients in this series, 38 per cent were considered inoperable when first seen. When this 38 per cent is added to the deaths of the surgically treated cases, the five-year survival drops from 50.5 per cent to about 30 per cent.

The criteria of inoperability at the clinic from which this report originates are those generally accepted: (1) demonstrable metastases to the skeletal system or other remote organs, (2) demonstrable involvement of the supraclavicular lymph nodes, (3) far advanced ulcerative condition, or marked fixation to the chest wall, (4) a very poor general condition or associated lesions making the prognosis for life limited, and (5) rapidly growing so-called cure carcinomas arising in the lactating breast or during pregnancy.

The 90 cases operated upon have been carefully analyzed by the author. The average age of the patients was fifty-four and one-half years, the oldest patient being seventy-four years and the youngest twenty-four years of age. The time that elapsed between the first symptom of trouble and the first visit to the physician varied from one day to twenty years, the usual delay being from six to eighteen months.

There was a history of preceding trauma in only 10 per cent of the cases.

The first symptom most often noted was a mass in the breast (84.4 per cent). The symptom second in frequency was pain (8 per cent). Discharge was noted from the nipple in 3.3 per cent of the cases, but bloody discharge was noted only 1 time.

The lesion occurred most frequently in the upper and outer quadrant of the breast. It was in the upper half of the breast 3 times as frequently as in the lower half and the lateral half was involved almost 3 times as often as the medial half.

The interesting observation on axillary metastases showed that in 4 cases clinical findings of axillary metastases were recorded, but such metastases were found in histological section in only 3 cases an error of 75 per cent. In 49 cases no nodes were palpable clinically and metastases were demonstrated histologically in 30 of these specimens, an error of 4 per cent.

The operative technique as that of radical mastectomy. Primary closure as done in 87.8 per cent of the cases. There was no operative mortality. In this series no pre-operative radiation therapy was used, procedure now employed by the

author. Most of the patients received postoperative x-ray therapy. Infection was the most common post-operative complication, it occurred in 30 per cent of the cases. Edema of the arm occurred in 10 per cent of the cases.

Every one of the 90 cases operated upon was followed up by the author. The incidence of local recurrence was 18.9 per cent. Metastases occurred in more than half of the cases. Since most of the patients died at home, autopsies were not often done thus these figures are not accurate. In the cases closed by skin graft the local recurrence was extremely high 47.3 per cent as compared to 7.7 per cent when primary closure was done.

The most important factors for the prognosis are age, lactation, rate of growth, and extent of the disease. The location of the lesion did not affect the prognosis in this series. EAST G. LATIMER, M.D.

TRACHEA, LUNGS, AND PLEURA

Taffel, M. The Repair of Tracheal and Bronchial Defects with Free Fascia Grafts. *Surgery* 910 5 56.

Four series of experiments were carried out on 20 dogs.

In the first group a full thickness segment one square was removed from the trachea of the animals and the defect closed with a free patch of cervical fascia. Then at intervals from one to eight weeks the dogs were sacrificed for examination. After four weeks there seemed to be complete regeneration of the epithelium and no traces of the original graft were left. Well differentiated duct connective tissue filled the former gap.

In the second series a segment 0.5 cm. by 3 cm. was excised from the main left upper-lobe bronchus and bridged with a free flap of deep fascia removed from the chest wall.

In the third series of experiments closure of the left upper-lobe bronchus was made after lobectomy.

In the last series the left lung was removed, no bronchial anastomosis being left. The tracheal defect as then closed with deep thoracic fascia.

In all of the experiments black silk was used for the suturing material.

All of the animals survived the operative procedures and there were no instances of subcutaneous emphysema, pneumothorax, hydrothorax, or pleural emphysema, no complications nor parenchymal lesions could be detected at any time.

The healing process followed essentially the same pattern, whether the defect was in the trachea or bronchus. The graft did not appear to remain viable but acted as a temporary and air tight scaffold which was quickly invaded and replaced by wandering cells and proliferating fibroblasts. Regeneration of the respiratory mucosa was complete after 1

weeks. There was no clear evidence of any regeneration of the muscularis mucosa.

The value of closing defects in the walls of the respiratory tubes with fascial grafts is that the caliber of the bronchus or trachea need not be narrowed by approximating the free edges of the defect. Small benign and early malignant lesions may be resected, and closure of the bronchus at its point of bifurcation is possible. J. DANIEL WILLEMS, M.D.

Maxwell, R. J. C. Thoracoscopy of the Extrapleural Pneumothorax. *Brit M J*, 1940, 2, 107.

The author takes cognizance of the fact that however dry the walls of an extrapleural pneumothorax may be at the completion of pneumolysis, a greater or smaller amount of oozing invariably occurs afterward. He quotes Schmidt as finding a fairly large postoperative hemorrhage in 10 per cent of the 200 cases on which he reported.

Maxwell has done a number of thoracoscopic examinations and reaches the following conclusions:

The endoscopic examination of the extrapleural pneumothorax in which postoperative hemorrhage has occurred reveals the constant finding of cones of blood clot arising from the chest wall. These cones are sometimes free and sometimes fixed to the lung. In some cases organization and contraction of these cones may be factors in the obliteration of the pneumothorax space. PAUL MERRELL, M.D.

Joly, H. Partial Postero-Inferior Thoracoplasty (La thoracoplastie partielle postéro-inférieure). *J de chir*, 1940, 55, 501.

Joly reports the use of partial posterior thoracoplasty in 7 cases in which the tuberculous cavity was in the lower lobe of the lung, such isolated cavities in the lower lobe are not unusual. Pneumothorax cannot always be carried out successfully in these cases and phrenicectomy has not given good results. On the other hand, an extensive thoracoplasty seems too radical an operation for a cavity occupying a limited portion of the lung.

Roentgenological examination from the lateral (profile) view shows that cavities in the lower lobe are in the posterior portion of the lung, and clinically these cavities show little tendency to heal. The partial posterior thoracoplasty operation was selected for the treatment of such cases because it was the best means of producing the collapse of the involved portion of the lung and the obliteration of the cavity. In most cases the posterior portions of 4 of the lower ribs in the vicinity of the cavity were resected, in 1 case in which the cavity was small, only 3 ribs were resected, in another with an unusually large cavity, 5 ribs were resected. The seventh, eighth, ninth, and tenth ribs were most frequently resected, but if the cavity was in the upper part of the lower lobe the fourth, fifth, sixth, and seventh ribs were selected. The ribs to be resected were selected on the basis of the roentgenological findings, and especially the roentgenogram "in profile." As a rule each rib was completely dis-

articulated from the corresponding vertebra, preferably with resection of the transverse process, and the entire posterior portion of the rib was removed (about 12 cm in the adult). The operation was usually done under local anesthesia, novocaine in a 1:200 solution without adrenaline was employed. After resection of the rib the periosteum of the stump was treated by the application of 10 per cent formol solution, methylene blue was added to this solution, so that its absorption by the periosteum could be clearly seen, and contact with the surrounding muscle tissue was avoided.

Seven cases are reported in which this technique was used, 2 in children and 5 in adults. In 5 cases the cavity completely disappeared (including the 2 cases in children), in 2 cases there was marked improvement. The results in this series were, therefore, very satisfactory, especially since no other treatment has proved effective in this type of lesion.

ALICE M. MEYERS

Polak, M. The Histogenesis of Pulmonary Epithelioma (Histogenesis del epiteloma pulmonar). *Rev de med y ciencias afines*, 1940, 2, 223.

The author states that from the fifth month of intra-uterine life the lung is formed on a mesenchymal base traversed in all directions by blood-vessels and by dichotomously branching endoderm through



Fig 1 Undifferentiated "oat-cell" tumor



Fig. Bronchial adenocarcinoma.

the mesoderm which plays a passive part. Some authors believe that the mesenchyme takes an active part in this process by centrifugally expanding and dividing up the centrifugally expanding endoderm. About the fifth month the proximal bronchial epithelium becomes cylindrical and a basal membrane appears while the distal epithelium becomes cuboidal with hyperchromatic nuclei and clear cytoplasm. With the expansion of the alveoli at birth there is a modification of the mesenchyme in the development of collagenous and elastic fibers. Many authors believe that from birth to adult life there is a continuation of the process of alveolar proliferation with increase in the quantity and size of the alveoli. The author then proceeds with a detailed description of the histology of the epithelium of the broncho-alveolar tract. The study of pulmonary neoplasms necessitates a perfect knowledge of the structure of the lung especially of the alveoli. With regard to the latter there has been much controversy. Modern histologists believe that the covering of the alveoli is interrupted; the chief argument concerns the nature of these cells. Koelliker, Dogliotti, and others believe these alveolar cells are epithelial. Maximova, Poissard, and still others state that they are mesenchymal histiocytes and belong to the reticulo-endothelial system. After reviewing the literature on this subject the author

notes that most of the evidence is in favor of the latter or mesenchymal theory.

After these preliminary discussions on histology and embryology the author continues the discussion on the histogenesis of pulmonary epitheliomas with the comment that most authors differ in their interpretation of the above-mentioned histology and embryology. Fiedler in 1906 was the first to start this study; on the basis of 54 cases he concluded that most of the epitheliomas originated in the bronchial mucosa. According to Harding, 85 per cent of pulmonary tumors originate in the bronchial epithelium and 5 per cent in the alveoli. The author distinguishes three types of pulmonary carcinoma: those arising from the bronchial epithelium, those arising from the glandular mucosa and those arising from the alveolar epithelium.

On the basis of his own studies of 80 cases, the author believes that all pulmonary carcinoma develop solely from the bronchial epithelium, especially from the "basal cell of Krompecher." His presentation drawing which illustrates the histogenesis of the various types of bronchial epithelioma from the basal cell of Krompecher. On this basis he classifies pulmonary carcinomas as follows:

1. Undifferentiated epitheliomas
 - a. Round cells
 - b. Fusiform cells (oat-cell tumors)
- Epitheliomas in the process of differentiation
 - a. C. bold or polygonal
 - b. Cylindrical
 - c. Microscopically cuboid or cylindrical
3. Differentiated epitheliomas
 - a. Spinoepithelioid-epidermoid
 - b. Glandular or adenocarcinoma.

For practical use he suggests the following simple classification:

- Undifferentiated epitheliomas
- Epitheliomas in the process of differentiation
3. Differentiated epitheliomas (epidermoid or glandular)

The author notes that the alveoli give origin to reticulosarcomas. If the same pulmonary tumor one may encounter the various histological types. At times it is very difficult to determine the bronchial origin in the undifferentiated tumors.

A colored drawing, 7 photomicrographs, and bibliography are presented to clarify the text and complete this instructive essay.

JACOB E. KLEIN, M.D.

Morris, J. H., and Harken, D. E. The Superior Pulmonary Sulcus "Tumor" of Pancoast. In Relation to Hare Syndrome. *Ann Surg* 1940.

It has been the purpose of this study to evaluate the pathological status of the so-called superior pulmonary sulcus tumor and to establish the clinical significance and relationship thereto of the syndrome known as Hare or Horner syndrome. The controversial literature pertaining to this subject has been analyzed, the history and dis-

ical aspects of Hare's syndrome have been considered, and the clinical and pathological aspects of the superior pulmonary sulcus tumor, in conjunction with a carefully studied series of 8 apical tumors, have been submitted. It is the authors' belief that this material presents evidence which adequately supports the following conclusions:

1. There is an epithelial neoplasm which occurs at the superior pulmonary apex which is distinguished from all other tumors common to this region, because of (a) its lack of origin from any known adjacent tissue or from metastatic foci, and (b) its histology which suggests an embryonal source.

2. The accurate identification of this tumor must be conditioned upon (a) the exclusion of lung, pleura, ribs, perosteum, vertebrae, and mediastinal structures as a source of origin, (b) the histological proof of a squamous cell epithelioma, and (c) satisfactory demonstration of the absence elsewhere in the body of a possible focus for metastatic spread.

3. The syndrome, redescribed by Pancoast and known as the "Pancoast syndrome," is decidedly not a specific manifestation of the superior pulmonary sulcus tumor, but may be induced by various types of neoplasms as well as other pathological conditions in the proximity of the pulmonary apex.

4. The syndrome attributed to Horner was fully described by Hare thirty-one years before Horner's report and, therefore, it should properly be known, and is so herein recorded, as "Hare's syndrome."

5. In its early stages, this disease is almost invariably treated as arthritis, neuritis, apical tuberculosis, angina pectoris, or subdeltoid bursitis, and early roentgenological study in obscure conditions of this type may well bring them within the realm of efficient surgical therapy.

6. Roentgenotherapy has proved to be futile as a method of treatment.

7. Of the 8 cases of apical tumor presented, 3 definitely conform to the afore-stated conditions for identification of the superior pulmonary sulcus tumor.

SAMUEL H. KLEIN, M.D.

Lester, C. W. The Complications of Empyema in Children. *Am J Surg*, 1940, 40: 227.

The author studied 248 cases of empyema occurring on the Children's Surgical Service at Bellevue Hospital in the past ten years. Of these cases only 60, or approximately 25 per cent, were free from any complications. This figure is a little above the average for complications.

Of the 28 deaths in the series, only 1, that of a six-week-old infant, was attributed to empyema *per se*. This patient died of shock when simple intercostal closed drainage was done to relieve dyspnea caused by a great collection of pus in the chest. Three other patients died before the empyema reached the operable stage.

Of the 9 patients who died because of septicemia, all had hemolytic streptococci in the blood culture, 6 having the same organism in the chest fluid, the three others had pneumococci in the chest.

Blood cultures revealed that both the 2 fatal cases of pericarditis and of peritonitis were merely local manifestations of a general septicemia. The 3 cases of meningitis and the 2 of brain abscess all proved fatal. The latter revealed streptococcus viridans both in the empyema pus and in the brain-abscess pus.

Four fatalities were attributed to exhaustion. Of 16 cases complicated by measles, 1 proved fatal. There is no relationship between empyema and contagious diseases of childhood, however, this is not true of otitis media, which occurred in 35 cases.

Pneumonia as a complication of empyema resulted in a 36 per cent mortality, a total of 4 deaths. The later the pneumonia appears in the postoperative course, the better the prognosis.

In 27 of the patients, osteomyelitis of the rib occurred, 16 of these had had intercostal drainage and it is possible that pressure of the drainage tube may have caused the osteomyelitis. In other instances undrained pockets in a long-standing sinus were found.

Tuberculosis developed in 5 patients with sinuses of long standing through which an acute empyema had been drained. In 4 of these tuberculosis of the lung could not be demonstrated. In the fifth patient active pulmonary tuberculosis, and tuberculous iritis and keratitis developed.

One patient died because Dakin's solution was aspirated through an unsuspected open bronchopleural fistula. Bronchopleural fistula occurred in 31 patients, and caused 7 deaths. Two deaths occurred in infants because of tension pneumothorax.

Cellulitis of the chest wall occurred in only 4 patients, 1 case being fatal.

Perforation of the diaphragm occurred in 3 patients, twice from subphrenic abscess and once from tuberculosis.

Two cases were complicated by foreign bodies lodging in the pleural cavity.

The author concludes that the fatalities in empyema are due chiefly to the complications which are usually the result of the original or some intercurrent infection.

J. DANIEL WILLEMS, M.D.

MISCELLANEOUS

Ryle, J. A. Penetrating Wounds of the Chest. Experience in the Last War. *Lancet*, 1940, 239: 63.

In a consecutive series of 130 cases of penetrating wounds of the chest admitted to a Central Concentration Station in 1917, the total mortality was 23 per cent. In approximately 60 per cent of the cases there was no indication for surgical intervention. The most common type of case calling for watchfulness was the closed hemothorax. More than 60 per cent of all the cases fell into this group. Of these, three quarters remained sterile and were treated conservatively with aspiration. The gravest cases, as is well recognized, were those with a leaking hemothorax, a sucking pneumothorax, or a diaphragmatic injury. Simple drainage of the pleura be

cause of infection was the most common operation. Wounds of the pericardium with small fragments did not cause particular anxiety.

With more prompt admission of the cases, earlier and better treatment of shock and hemorrhage, a lower incidence and better treatment of infection, earlier expert surgery with repair and closure in a selected group of the greater open cases, and a lowering of mortality should be possible. Improved technique should not, however tempt the surgeon to interfere in all types of cases.

The examination of specimens obtained by routine needling plays an important part in the management of cases. Such specimens should be examined with the eye and the nose by direct examination of films for bacteria, and by cultivation.

Patients with penetrating wounds of the chest should be substituted as little movement as possible and transportation from one hospital to another in the earlier stages should be sanctioned only on some very urgent plea. The probable contribution of posture to contralateral collapse should be borne in mind. J. THOMAS WINTERBURY, M.D.

Hartzen, J. B. Diaphragmatic Hernia in Children. A Review of 68 Cases Occurring in Children under Ten Years of Age Treated by Operation. *Am J Surg* 1940, 48, 484.

The author collected the reports on 68 cases of diaphragmatic hernia in children, including one

of his own. The incidence of this type of hernia is slightly higher in males than in females. The most common location of the hernia, which is of the false type, is through the left diaphragm.

The symptoms vary with the age of the child. The predominant symptoms in infants in the first year of life are dyspnea, cyanosis, and vomiting; after the first year the chief symptoms are vomiting, pain, and obstruction. The operative mortality rate in infants under one year of age was 50 per cent; after the first year the mortality dropped to 27 per cent. The operative mortality is increased if there is partial or complete obstruction, or if the small bowel is in the thoracic cavity.

A positive diagnosis cannot be made pre-operatively without the aid of an x-ray examination. Without x-ray confirmation, the percentage of error in the diagnosis of this lesion is very great. A correct pre-operative diagnosis permits better preparation of the patient and emptying of the stomach and therefore reduces the danger of surgical intervention.

The author concludes with the following statements: pre-operatively the stomach should be lavaged and completely emptied; crushing the phrenic nerve greatly facilitates the repair; the abdominal approach is safest, air injected about the viscera in the chest makes it easier to return the viscera to the abdomen; postoperatively the pneumothorax should be aspirated. EARL O. LATTIN, M.D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Mannell L. Evaluation of the Injection Treatment of Hernia in Older Patients. A Three Year Statistical Analysis. *Br J Surg*, 1930, 41: 114

While this article deals principally with the sclerosing injection treatment of hernia in older persons, statistics dealing with the results obtained in younger persons are also given. Nearly every type of hernia has been included, as has all a nearly every age group.

Solinasol (a 5 per cent solution of sodium salts of certain of the fatty acids of the oil extracted from a seed of the pyllium group) has been used as a sclerosing agent. A well fitting truss is worn night and day during the course of the injections, and in the daytime thereafter. The author recently has been using semi-elastic trusses only. Irreducible hernia, sliding hernia and undescended testicles are contraindications to injection therapy.

It is noteworthy that a total of 673 patients were seen in the clinic. Of these, 1 refused any treatment other than the fitting of a truss, 96 were referred for surgery, and 157 were given the injection treatment. The following table delineates the results as concisely as possible:

TABLE I—RESULTS OF INJECTION METHOD

Group A (cured without truss for more than six months after treatment)	10 or 12 per cent
Group A (possibly cured but still wearing truss six months after treatment)	0 or 1 per cent
Group A (possibly cured and still wearing truss less than six months after treatment)	76 or 76.4 per cent
Group A (possibly cured but not seen after one year of observation)	14 or 89 per cent
Group B (clinically improved but not cured, includes those still under treatment)	48 or 30.4 per cent
Group C (recurrences and failures)	26 or 16.4 per cent
Group D (operated on after injection treatment)	5 or 3.2 per cent
Total number of hernias	158

It is to be noted that the rate of recurrence and failure is higher than in a well controlled series of operative cases, but that many patients were reported as being clinically improved. When one notes from further examination of the article, that a great number of the operations were carried out in elderly people, most of whose age ranged from forty-one to seventy years, then the "improved" cases assume greater importance. For one thing there were no deaths and the complications were minimal.

The authors believe that the injection method is the treatment of choice in elderly persons, provided the hernia can be reduced, and that it is an alter-

native method in younger patients who refuse surgery. *John Wirtz, Jr., M.D.*

Korzun P. J. The Prophylactic and Therapeutic Use of Drainage of the Peritoneal Cavity in Suppurative Peritonitis. *Am J Surg*, 1930, 45: 291

While one school of thought voices the opinion that drainage of the peritoneal cavity is never efficient, another, with fewer adherents, holds the view that a drain retains its absorbing properties for from five to six days, although in a less degree than in the first twenty-four hours.

The author introduced gauze sponges into the abdominal cavity of 30 rabbits through a low midline incision. After intervals ranging from twenty-four hours to one month from 50 to 50 c.c. of a physiological saline solution stained with methylene blue or trypan blue were injected through a small incision in the upper abdomen. The examination of the removed sponges showed that in the first few days after their introduction into the peritoneal cavity they were not completely isolated; the sponges were stained with the liquid introduced into the abdominal cavity. Gradually the amount of fluid absorbed by the sponges diminished.

In another series of experiments on 27 rabbits, a midline incision was made and the large intestines were intentionally injured for the purpose of inducing peritonitis. The perforation was sutured and gauze sponges were placed in the vicinity of the infected area, while in the control experiments the abdominal wall was closed without drainage.

The experiments showed that gauze sponges are valuable for prophylaxis and therapy of generalized suppurative peritonitis because they stimulate the formation of fibrous barriers which isolate the infectious areas. The gauze sponges retain their function the first six or seven days after their introduction; their absorbing qualities then gradually subside.

The gauze sponges introduced into the peritoneal cavity become saturated with the fibrinous exudate and closely connected with granulation tissue which in turn is attached to the abdominal organs. Therefore they should be removed very gently to avoid any trauma to the abdominal contents.

JOSEPH K. KARAT, M.D.

Brown, M. J. Mesenteric Venous Occlusion. A Clinical Entity. *Br J Surg*, 1930, 40: 24

There have been about 772 cases of mesenteric venous occlusion reported and discussed in the literature. The author believes that venous occlusion is a separate clinical entity from arterial occlusion. The aim of the present article is to present additional data on the clinical picture of mesenteric venous occlusion, in order to make this lesion more

cles cut. The cause of mesenteric occlusion may be classified under the following:

1. Debilitating and degenerative diseases.
2. Inflammatory lesions of the abdomen.
3. Neoplastic diseases of the abdomen.
4. Mechanical factors i.e. surgery trauma, obstruction and hernia.
5. Undetermined origin of the thrombosis.

Ochsner stated that an unrecognized cause of mesenteric venous occlusion is associated with prolonged ingestion of alcohol and that the prognosis in this type is good. He reported 5 such cases, all operated upon but only 1 undergoing resection, with 80 per cent recoveries.

It is generally conceded that the symptoms of arterial occlusion are more fulminating, like the progression in the venous type is slower. The onset of pain may be rapid or slow. It was found to be present in 100 per cent of the cases studied by Meyer. The contrast between the severity and persistence of the pain and the lack of physical findings was the most significant diagnostic feature of mesenteric venous occlusion.

Vomiting occurs in about 50 per cent of the cases with combined venous and arterial occlusion. Constipation was considered to be more common than diarrhea. Blood was noted more often in the cases of venous thrombosis. Distention is considered by most writers to be late manifestation and is not relieved by bowel movement or enemas. The degree of shock present is proportional to the degree of mesenteric involvement.

The temperature at the onset of the condition is either normal or subnormal but within a few hours may rise to 100°F. The pulse varies with the temperature and degree of shock. In severe cases it is found to be rapid and thready in character. Pallor may be the presenting feature associated with shock. Tenderness is much less than expected, proportionate to the pain and extent of the lesion. There is general abdominal tenderness without localization. When the occlusion becomes complete in advanced cases the tenderness tends to be epigastric. Rigidity is generally lacking early but becomes more definite as the parietal peritoneum becomes irritated. The finding of palpable mass cannot be depended upon with any regularity. When the entire small bowel is affected by the thrombotic process, there is generally an absence of peristaltic sounds. Bloody stools and an increasing leukocytosis are frequently present. The report describes 3 cases in detail.

Although enterostomy has been advocated by some surgeons as the method of treating this lesion, most writers agree that primary resection of the involved portion of the intestine is the best approach to this problem. Resection of from 3 to 6 ft of intestine on both sides of the area of infarction is necessary to prevent extension of the thrombosis. In certain patients in whom thrombosis results from infection such as appendicitis Jones advocates the Wilms-Braun operation of ligating the ileocolic vein to prevent its extension. Jones W. V. M.D.

GASTRO-INTESTINAL TRACT

Schindler R. Results of the Questionnaire on F. talities in Gastroscopy. *Am. J. Dig. Dis.* 940, 7, 203

1 October 1939, Schindler published questionnaire with the object of determining whether or not F. talities had occurred because of the use of the flexible gastroscope. Gastroscopists were asked the following questions:

1. Have you ever observed death, following gastroscopic examination, which you attributed to traumatism caused by the instrument?

2. Were there recognized contra-indications excluded?

3. How many gastroscopies have you carried out?

A total of 60 gastroscopists reported their experience in 33 gastroscopies. In this series there was only 1 death which had to be attributed to the use of the gastroscope, a fatality rate of 0.03 per cent. Eight perforations of the stomach, and 1 perforation of the jejunum in a patient with a resected stomach have been observed. All patients recovered either after conservative treatment or after surgical interference. Among other complications mentioned, the toxicity of protargol which is used for the anesthesia in gastroscopy, as discussed.

JOHN W. V. M.D.

Zollinger R. Gastric Resection with Removal of the Fundus in the Treatment of Duodenal Ulcer. *Surgery* 940, 8, 70

It is not the purpose of this article to enter into discussion of conservative versus radical surgery in the treatment of duodenal ulcer but rather to discuss a procedure which uses antacid reduction in the total amount of hydrochloric acid secreted.

The author cites two reasons for utilizing fundus resection:

1. It has been dissatisfied with the results obtained from some of the other accepted methods of resection. In his opinion the Hoyer modification of the Billroth I type of operation seemed to answer best the experimental requirements. It provides for resection of the ulcer-bearing area and reanastomosis of the remaining stomach to the duodenum, which has a higher tissue resistance to gastric juice than the jejunum. It gives patulous pylorus, so essential for avoiding recurrent ulceration from mechanical cause and, in addition, it permits certain amount of intragastric regurgitation of alkaline duodenal juices. However after clinical trial, he found approximately 50 per cent of the patients followed up for five years developed recurrent difficulty. It was abandoned.

The weakness of Billroth II types of resection is that sufficient acid-bearing tissue is not removed. Even in so-called radical resection of the Billroth II type, in which three-quarters or more of the stomach is removed, it is customary to carry the resection high on the lesser curvature and to leave a sufficient amount of greater curvature to facilitate gastrojejunostomy. Apparently fear of develop-

ment of a gastric ulcer in this location after resection prompts this wide removal of lesser curvature. Clinically, however, recurrent ulceration almost invariably is found in the jejunum or about the stoma and is uncommon on the lesser curvature after resection for duodenal ulcer. Marginal or jejunal ulcers occur not only after conservative surgical procedures, but also not infrequently after the Billroth II types of resection. The incidence of recurrent ulceration after resection may be partially explained by the fact that various amounts of fundus, rich in surface area of acid-secreting tissue, have been retained, while most of the lesser curvature, low in surface area of acid-secreting tissue, has been resected.

2 The clinical results and experimental evidence imply that fundusectomy is sound. A number of years ago Connell proposed diminishing the hydrochloric acid secretion in patients with intractable duodenal ulcer by means of partial fundusectomy. After fundusectomy the alkaline juices would be sufficient to combat the decreased volume of gastric juice, and thereby prevent recurrent ulceration.

After weighing the experimental and clinical evidence for fundusectomy, the author resected the stomach by the Pólya method and removed varying amounts of the fundus. Resection of the antrum, especially in severe cases of jejunal ulceration after gastroenterostomy, seemed desirable not so much because it would reduce the secretory capacity of the stomach but because it would provide a patulous stoma. In addition to fundusectomy a departure from the radical type of Pólya resection was decided upon: the lesser curvature was not to be divided high but in the neighborhood of the incisura angularis. This would insure a longer tube of stomach along the lesser curvature, would provide a more satisfactory postoperative gastric capacity, and would facilitate gastrojejunal anastomosis. The obvious difficulty that suggested itself was the danger associated with the approximation of two suture lines at the lower end of the gastrojejunal anastomosis, especially when the blood supply of the remaining stomach would be dependent only on the left gastric artery. In experiments on dogs it was found that the blood supply was adequate and that approximation of the two suture lines at the lower angle of the anastomosis could be carried out with safety.

Gastric resection with removal of a large amount of the acid bearing tissue by means of fundusectomy and with restoration of gastric continuity by a gastrojejunostomy of the Pólya type to a long tube of lesser curvature has been performed by the author on 2 patients. Each of the 2 patients in whom this operation was carried out had had a previous gastroenterostomy with a resultant jejunal ulcer, so that it was necessary to close the opening in the jejunum and select a site distal to the ulcerated area for the new gastrojejunal stoma.

Sufficient data are not available yet to determine the actual efficacy of fundusectomy, either with or without short-circuiting procedures or resection. The clinical and experimental reports, however,

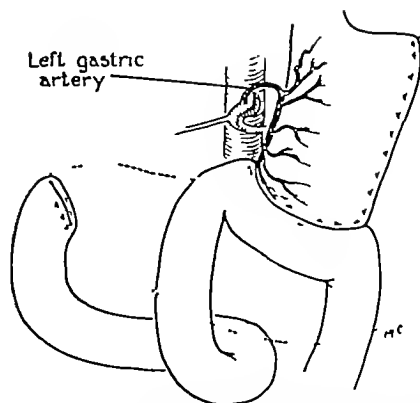


Fig 1 Schematic drawing, illustrating Pólya resection combined with fundusectomy. Note the amount of lesser curvature retained.

indicate that removal of the fundus might be considered in the severe case of duodenal ulcer or recurrent ulceration following previous surgical procedures. The final evaluation of any operation for ulcer cannot be determined until a sufficient number of cases have been followed up with roentgenological examinations, for a period of at least five years.

JOSEPH K. NARAT, M.D.

Sugasti, J. A. Benign Tumors of the Stomach (Tumores benignos del estómago). *Bol. Soc. de cirug. de Rosario*, 1940, 7, 146.

The author presents a clinical report on an ulcerated fibromuscular polyp of the stomach, preceded by a review of the literature and a detailed discussion of the subject.

Benign tumors of the stomach are very rare. Von Eiselsberg found only 3 benign tumors in 2,400 gastroduodenal resections—2 papillomas and 1 fibroma. The favored site of such tumors is the pylorus and the pyloric antrum. The surface of these tumors is smooth and regular, although sometimes it may ulcerate. The tumors may be sessile or attached by a pedicle, which gives them a certain degree of mobility. They may be single or multiple (especially in polyposis). Among the former type the most common are the myomas and fibromas. Among the epithelial tumors there may be papillomas or adenomas. All these tumors may undergo secondary changes and become cystic, myxomatous, or hemorrhagic.

There is nothing particularly characteristic about the symptoms. In 17 per cent there may be no symptoms. For the most part the symptoms depend on the localization, dimensions, and number of tumors. There may be epigastric pain after meals which radiates to the hypochondrium or the back. Vomiting is relatively frequent. Anemia may be caused by ulcerations in the tumor. There is frequently anorexia associated with malnutrition. In most cases there is a hypoacidity. Occasionally



Fig. Gastric tumor.

a large tumor may be palpable through the abdomen. Gastroscopy may aid in the diagnosis of these tumors. X-rays reveal a mild gastric defect caused by the tumor. Under fluoroscopic examination the tumor may be moved about in the stomach if there is a pedicle. Normal gastric peristalsis is not disturbed. The most serious complications are hemorrhage, pyloric stenosis, and gastroduodenal invagination. The treatment is surgical and depends on the location, type and extent of the tumor.

The author reports the case of a sixty-two-year-old woman who had been ill for 4 years with intercapular pain. X-ray examination revealed benign tumor in the region of the antrum (Fig. 1). Under local anesthesia the stomach was opened and a small benign tumor on a pedicle was removed from the antrum. The patient made an uneventful recovery. The histological diagnosis was fibromuscular ulcerated polyp. Several illustrations of roentgenograms and photograph of the tumor are presented.

JACOB E. KLINE, M.D.

Lemmon, W. T. and Paschal, G. W. J. Total Gastrectomy for Carcinoma of the Stomach. *Ann. Surg.* 1940, 51.

The first successful total gastrectomy performed on man was done by Schlatter in 1897. The correct usage of the term "total gastrectomy" implies nothing short of complete removal of the entire stomach. The operation affords little hope of permanent cure but it does prolong life and adds materially to the patient's comfort. A search of the literature shows that most patients have died within eighteen months after total gastrectomy. Zikoff's

patient lived four years and eight months, the longest survival recorded. Mayo Allen, and others have reported survivals for as long as four years. In recent years the operation has been attempted more frequently.

Lemmon and Paschal reported that 88 cases of total gastrectomy had been performed up to that time. There was a primary overall mortality rate of 90 per cent. Peritonitis and shock were the predominant causes of death. Recently Labey reported 8 total gastrectomies at his clinic, the last 5 of which have been successful. Recurrence of the malignancy is responsible for most of the deaths subsequent to operation.

Lemmon and Paschal report successful survival for seven months after total gastrectomy. The patient, a female aged sixty-three years, complained for the past six months of great difficulty in swallowing. Vomiting and emesis had become persistent the past three weeks. There was epigastric pain and weight loss of 5 lb. during the past six months. The blood count totalled 4,070,000 red cells, the leucocytes 9,000, and the hemoglobin 60 per cent. Gastric analysis showed the total acidity to be 7 and the free hydrochloric acid 3; blood was bright. A mass was palpable in the epigastrium and the x-ray diagnosis was extensive gastric carcinoma.

Under spinal anesthesia the abdomen was opened through an upper right rectus incision and the stomach was found to be completely involved with carcinoma. The lymph nodes along the curvatures were not palpable. The liver and spleen were free from palpable or visible metastases. Total gastrectomy was elected as the only procedure feasible. The blood supply was doubly ligated at both curvatures, the ligation beginning at the duodenum and extending to the esophagus. The distal end of the severed and mobilized duodenum was invaginated with a Connell stitch followed by purse-string sutures and reinforced by an omental graft. The free distal portion of the stomach was protected with gauze and used for down and traction. A very important procedure was next carried out—a flap of peritoneum was reflected from the diaphragmatic surface anterior to the esophagus thus as to be used later for covering of the anastomosis site. Since the lower esophagus was found infiltrated with the cancer about 7 cm. of the thoracic esophagus was drawn downward and fired. By traction and rotation upward of the stomach, the posterior wall of the esophagus was exposed. A loop of jejunum, 15 cm. from the duodenojejunal junction, was selected, carried upward in front of the colon, and apposed to the posterior esophageal wall by fixation with several interrupted linen sutures. A continuous linen suture approximating the esophagus and jejunum was inserted. After packing off the esophagus as incised parallel to the center line for about 2 cm. and the contents were aspirated. An opening of equal size was made in the jejunum. A posterior row of continuous locked sutures as applied with interrupted sutures to control hemorrhage. The remaining

anterior wall of the esophagus was next divided and the stomach removed. The anterior edges were approximated with a Connell suture. The outer posterior suture was then continued anteriorly to complete the second row of sutures through the serosa layer. The previously reflected peritoneal flap was now sutured to the line of anastomosis. The jejunum, on both sides of the anastomosis, was now fixed to the parietal peritoneum by interrupted linen sutures; the tension on the anastomosis thereby being relieved. A jejunojejunostomy was now performed 14 in from the anastomosis. The abdomen was closed in layers without drainage. The operation consumed three hours. A venoclysis was administered during the operation, 2,000 c cm of 10 per cent glucose in saline solution being given.

The patient had a smooth convalescence. She was fed by vein and one blood transfusion of 400 c cm. On the fourth day fluids were given by mouth and on the sixth day soft foods. She was discharged from the hospital on the twentieth day and was able to take small frequent feedings without distress. She gained 5 lb at home and was given liver and iron with hydrochloric acid. A recurrence of the old symptoms about seven months later brought about the death of the patient.

The laboratory reported an extensive adenocarcinoma of the linitis plastica type with lower esophageal involvement. The author emphasizes the following important facts concerned with this operation: pre-ervation and utilization of the peritoneal flaps adjacent to the esophagus was a most important factor in preventing leakage at the anastomosis site, no Levine tube was employed at any time because of the patient's absolute refusal of the same; the anastomosis was performed without clamps chiefly because the stomach was used as a tractor to pull down the esophagus; and finally it was the author's first complete gastrectomy. The patient was comfortable and entirely free from complaints for a period of six months during which time she enjoyed eating, gained weight, and had a useful existence.

Jon W. Nezu, M.D.

Haworth, J. B., and Garland, L. H. The Differential Diagnosis of Mechanical and Paralytic Ileus, with Special Reference to the Early Diagnosis of Strangulated Obstruction. *Arch Surg*, 1940, 41, 147.

Roentgenographic findings in 100 proved cases of mechanical or paralytic ileus are presented. Early stages of acute mechanical intestinal obstruction due to adhesions or bands can often be differentiated roentgenologically from strangulated obstruction and from peritonitis. But it is frequently difficult to distinguish late stages of mechanical obstruction roentgenologically from paralytic ileus and from mesenteric thrombosis.

Consideration of the clinical history and findings is essential for the intelligent interpretation of abdominal roentgenograms in cases of suspected intestinal obstruction.

There is a small group of cases in which no roentgen evidence of intestinal obstruction is found, even though complete obstruction is present. For this reason a negative roentgenological report must not preclude careful clinical observation of the patient, and should be supplemented by repeated roentgenographic examinations at short intervals (about four hours), until a diagnosis is established.

J. THORSWILL WITHERSPOON, M.D.

Hinchey, P. R. Recurrent Gall-Stone Ileus. *Ann England J Med*, 1940, 223, 174.

Although cases of intestinal obstruction due to gall stones occur relatively frequently, the author reports this case because the patient suffered two episodes of acute intestinal obstruction within a three month period. Each attack required jejunosomy. This is the ninth case to be reported, and the patient is the oldest individual in whom recovery has occurred.

This case occurred in a seventy-nine year old widow. A pre-operative roentgenogram revealed what was interpreted as a large solitary gall stone. In March, 1930, after an attack of pain in the left lower quadrant the patient expelled a moderate sized gall stone in the rectum following a barium enema. It had 15 facets, indicating there were at least 15 or more stones to be accounted for. Prior to admission to the hospital 10 weeks later, she had developed a complete intestinal obstruction. A jejunosomy was performed and an impacted gall stone was removed from the midjejunum. No other stone was searched for at this time. The patient made an uneventful recovery, and was well until the following June, when she developed another intestinal obstruction. After three days of decompression of the bowel and fluid therapy, a second laparotomy was done and another impacted gall stone was removed some distance from the site of the first stone. A follow up in six months revealed that the patient was symptom free.

This condition occurs chiefly in women, their average age is sixty-six years. The mortality rate is high, averaging about 50 per cent.

Practically all gall stones that cause intestinal obstruction make their way into the intestine through a cholecystenteric fistula. These fistulas may empty into any one of the surrounding cavities or organs.

The size of the stone is not so important in the production of obstruction. The measured stones reported in the literature vary from 2 to 7 cm in diameter. The roentgenogram occasionally reveals an opaque shadow in the bowel area.

The treatment is that of intestinal obstruction, immediate surgery after suction decompression is necessary. An enterotomy without enterostomy or drainage of the abdomen is the operation of choice. The stone should be milked upward from the site of the obstruction, so that incision of the bowel will be in a more normal area. If the obstructive stone is faceted, additional search is indicated, provided

the patient condition permits. The Miller Abbott tube and 100 per cent oxygen inhalations appear valuable adjuncts to surgery in such conditions. In addition to spinal anesthesia and the correction of fluid and chemical deficits.

JOHN E. KRUPPACH, M.D.

Santanelli, L.: Multilocular Enterocystoma of the Small Intestine (Enterocystoma multilocula de Intestino delgado) *Bol. Soc. de Ciruj. de Rosario* 1940, 7, 7.

Santanelli reports the case of a boy aged four years, who presented a uniform swelling of the abdomen and had habitual constipation. The latter lasted four or five days and was accompanied by colic and vomiting and, at times, by slight fever. Examination after one of the attacks disclosed an irregularly ovoid, painless tumefaction, the size of a fist and having doughy consistency, it was movable in all directions, but only to a limited degree. Intervention was indicated but was deferred until the condition of the patient improved. However the child suddenly developed acute pain in the right iliac fossa, with vomiting, fever and abdominal defense over the region of the swelling. Operation revealed

mass which, at first sight, seemed to be a large cecum with lobulations, projecting on its anterior aspect a fissure, about 5 cm. long, from which issued a substance of sebaceous appearance mixed with granular fluid similar to that which filled the peritoneal cavity. Isolation of the mass showed that it was not the cecum, but that it was implanted on the ileum about 20 cm. from the ileocecal valve. In the region of implantation, the lumen of the small intestine was greatly decreased and the intestinal wall thickened and hardened for a distance of from 5 to 6 cm. The mass and the altered portion of the intestine were resected and the patient recovered.

The mass consisted of sacs separated by the mesentery; the smaller sac had a narrow neck that passed between the intestine and the border of the mesentery which here formed an eyelet; the larger sac adhered to the intestinal wall and was subdivided into 3 cavities intercommunicating by means of orifices having diameter of 1 cm. and located near the base of implantation of the sac. The external surface of the sacs presented the character of being constituted of pieces of small intestine in which portions of large intestine had been inverted. The substances present in the sacs consisted of flaccid debris, and the internal walls of the sacs were rough and ulcerated. A communication could be found between the intestinal lumen and the sacs. Microscopic examination showed a structure corresponding to that of the intestinal wall, but without mucosa or lymphoid formations. The diagnosis as multilocular enterocystoma of the small intestine.

Enterocystoma, which is also called enteroid cyst or juxta intestinal cyst, is an intestinal structure, is not frequently observed. The ileocecal region is most common site of ed, and only about 3 cases

have been reported in this location. The congenital origin of enteroid cysts is accepted. Their occurrence is directly related to the presence of diverticula of the digestive tract and their topographic variations are therefore numerous, e.g., mediastinal and rectal. Abdominal enterocystoma, especially of the small intestine, may develop in any part of the enteric wall and may be submucosal, intramucosal or subserosal; the latter type may be located in the antimesenteric aspect or in the part of the intestine into which the mesentery is inserted. Rather frequently the diverticulum which gives rise to the cyst loses its connections with the intestine and develops between the leaves of the mesentery at some distance from the intestine; at times it even occupies a frankly retroperitoneal position. In general, the walls of the enteroid cysts present a structure characteristic of the intestinal layers; there may be mucosal, muscular and serosal layers, lymphatic follicles, glands, and epithelium of various types, the structure depending on the presence of mechanical, inflammatory and other factors. The cyst contains a viscous,ropy substance which is also subject to many variations.

The clinical symptoms are caused by the presence of the tumor (such obstruction of the intestine, circulatory disturbances and irritation of the nerves) by infection or by rupture of the cyst. The tumor may remain unrecognized and be discovered only at autopsy or it may manifest itself very early and stimulate congenital hypertrophy of the pylorus or intestinal invagination of the duodenum. The tumor is often discovered, but the diagnosis is frequently erroneous. The treatment depends on various factors, such as localization, size, relationship to the intestinal wall, and complications. Enterectomy is the ideal treatment if favorable cleavage planes can be found and if the intervention does not compromise the intestinal circulation or the integrity of neighboring organs, such as the ureters, vena cava, and the spermatic or otero-ovarian vessels. Usually intestinal resection is necessary; the mortality is about 50 per cent. RICHARD KRELL, M.D.

Fallon, JI: Duodenum Inversum. *Irish J. M. Sc.* 1940, p. 53.

The term inversum does not refer to the inversion of the position of the duodenum, it is thus transverse, but rather to the configuration of the organ. Briefly, the third or horizontal part of the duodenum, instead of crossing the midline, crosses behind the descending part and crosses the midline higher up behind the head of the pancreas.

A case is reported in which the condition as discovered at autopsy. The current literature on the subject is reviewed; the condition may be more prevalent than is commonly supposed. A German roentgenologist, Sanders, has drawn attention to three "focal radiological signs."

More frequent than normal retention of contrast substance from the second part of the duodenum into the first and then to the bulb.

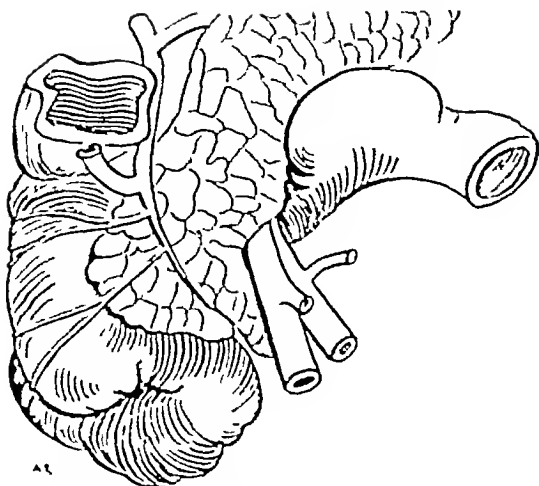


Fig. 1 The duodenum seen from the front. Note the constriction low down in the descending part and the acute kink which follows it.

- 2 Stasis or residue in the duodenum, particularly in the atypical lower duodenal knee
- 3 Remarkably rapid passage through the third part

JOHN WILSON LITTON, M.D.

Jackson A. S. and Perkins, R. Reducing the Mortality of Perforated Appendicitis: A Study of 100 Cases. *Am. J. Surg.*, 1940, 49: 250

Year after year, regardless of the great advances in medicine and surgery, the death rate from appendicitis continues to exceed that of thirty years ago. People die of appendicitis today because the appendix is allowed to rupture. This may be the direct result of the patient's delay in calling the physician or, more rarely, of the consultant's failure to recognize the great potential seriousness of the disease. There should be no mortality in those cases operated upon before rupture occurs. There will always be a mortality in operations after perforation has been allowed to take place. Because the diagnosis may be puzzling occasionally and the mortality in non-perforated appendicitis is almost negligible, it would seem advisable to operate when in doubt.

In any discussion of appendicitis, the results of large series of operations performed on simple acute and chronic appendicitis are of little value from a mortality standpoint. The author's study is based on a small series of 100 cases of perforated appendicitis observed over a period of fourteen years from January, 1924, to January, 1938. There were 64 males and 36 females in the series. The average male patient was thirty-one and one-half years of age. The average duration of symptoms for the men was three and three-tenths days and for the women four and six-tenths days. The mortality was 12 per cent. The average hospital stay was twenty-four and seven-tenths days, 32 patients had complications.

The greatest cause of the high death rate for appendicitis is delay on the part of someone who permits the appendix to rupture. The use of purgatives and laxatives is an important contributing factor to the early rupture. Adequate drainage continued sufficiently long is very important. The use of spinal anesthesia, hypodermoclysis, duodenal suction, carbon dioxide inhalations, oxygen, postural change, and digitalis or other drugs as indicated is helpful in the prevention and treatment of complications.

JOHN W. LITTON, M.D.

Bonorio Udaondo, C., Ramos Mejia, M. M., and Saletta, M. J. Considerations on 2 Cases of Severe Chronic Ulcerating Colitis Due to Spirochetes (Consideraciones sobre dos casos de colitis ulcerosa grave crónica de espiroquetas). *Arch. argent. de enferm. d. apar. digest.*, 1940, 15: 407

The authors have made a bacteriological study of 16 cases of chronic ulcerating colitis at the National Dispensary of Diseases of the Digestive Tract and found 2 cases in which the only causative agent was the spirocheta *curvata*. Both patients had presented episodes of severe diarrhea, accompanied by the discharge of mucus pus and blood and by tenesmus, for a period of years with varying intermissions. Recto-copies showed diffuse hyperemia of the mucosa which bled easily, and ulcerations of various sizes. Pathological material was collected by careful curettage of three zones: the healthy mucosa, the superficial part of the lesion, and the deep marginal part of the lesion. Smears showed gradually increasing numbers of spirochetes from the first to the third zone in the first case and from the second to the third zone in the second case. Auto-vaccines were prepared in both cases, but were not used because arsenical treatment given in the meantime caused prompt disappearance of the spirochetes and of the diarrhea with return to normal of the rectal mucosa. The treatment consisted of 2 tablets of amebarsone for eight days, some sulfarsenol was added in the second case which seemed to be more stubborn than the first.

Chronic ulcerating colitis runs a protracted course, presents a typical rectoscopic picture, and is characterized by remissions and recurrences as well as by its resistance to treatment. In 1924, Bergen showed that it is an infectious disease and described the diplostreptococcus that bears his name. Chronic ulcerating colitis due to spirochetes is infrequent and the latest opinion (Hassensforder) is that there are real associated amebic spirillar dysenteries, in which the saprophytic spirillum becomes pathogenic under the influence of the inflammatory condition of the intestine, which allows its proliferation and association with other germs, it must be admitted that it plays a pathogenic role, whether as principal or as associated agent and, whether it is pathogenic or not, it must be considered as a spirochete (Brumpt-Mesnil).

The authors give the following reasons for their support of the spirochetal etiology of their 2 cases:

The presence of *spirocheta caryoyrata* in the lumen of the intestine or in the feces is not a constant or banal fact, as demonstrated by a number of investigators.

2. The bacteriological study of 6 cases of chronic ulcerating colitis showed the presence of Bacter's diplostreptococcus in 7, or 42.5 per cent, and of *spirocheta caryoyrata* in 2 or 3 per cent, the latter figure being approximately the same that found by Streicher and Kaplan (17.5 per cent), but lower than that found by De Bittanz and Sevin (24.5 per cent).

3. The smears from the rectal ulcerations which showed the greatest number of spirochetes were those obtained by curettage of the deep parts of the lesions, while those from the superficial parts or from the healthy mucosa presented few spirochetes or none at all.

4. The inverse proportion between the number of ordinary germs of the intestine and that of the spirochetes in each series of smears from the three zones was suggestive: there were nearly pure spirochetes at the bottom of the lesion (third zone) while there was absolute predominance of the banal flora in the normal mucosa (not more than 1 spirochete was obtained from the first zone, in 50 fields).

5. Clinical cure was obtained within one week, by the use of arsenicals, and the anatomical cure was confirmed by rectoscopic examination one month later and has persisted for one year.

6. The search for spirochetes by the same means as used the first time failed to reveal any after the administration of arsenicals for ten days.

7. Arsenobismuth did not cause any noticeable improvement in control case of chronic ulcerating colitis in which there were few spirochetes that showed the same proportion to the number of banal bacteria in the series of 3 smears. The incidence of 2.5 per cent of spirochetal chronic ulcerating colitis and its favorable prognosis under arsenical treatment impose the necessity of adequate bacteriological investigation of all cases.

RICHARD KEEHL, M.D.

Granet, E. The Treatment of Perianal Tuberculosis. *Ann Surg* 940, 440

The author states that his interest in this problem was stimulated some years ago by the apparent disinterest in the management of perianal infections occurring in tuberculous patients in one of the large municipal hospitals.

Perianal infections complicating pulmonary tuberculosis are reported from 3 to 7 per cent. The pathology and the degree of perianal tuberculosis is described in detail. Treatment and anesthesia and postoperative treatment are also fully and well described. The results obtained in 100 consecutive patients operated on between April 1935 and September 1939 are given. Of these, 68 patients were proved to have perianal tuberculosis. Cure was complete in 40 per cent in less than four months, healing occurred in 7 per cent. 8 patients died and

7 were discharged from the hospital with unhealed wounds.

The author has discovered that perianal infections occur in from 3 to 7 per cent of patients with pulmonary tuberculosis, as compared with 5 per cent of cases in the non-tuberculous population. Tuberculous granulation tissue was found on histopathological examination in 70 per cent of 86 patients in his series. Fourteen cases early in this series had no biopsy. He found that multiple lesions were most common and that the lesions were frequently extensive and spreading usually occurring along the course of the superficial perianal lymphatics.

His opinion conservative surgery is futile in the treatment of these cases and effective treatment demands radical excision of all existing pathology. Foci of tuberculous granulation tissue must be carefully sought in the wound and completely eradicated when found. Operation in stages is frequently necessary because of the extent of the lesions. The author believes that if radical procedures, as described by him, are instituted early, high percentages of cures should result.

ERN. C. ROBINSON, M.D.

Coutts, W. E., Opazo, L., and Montenegro, M. Digestive-Tract Infection by the Virus of Lymphogranuloma Inguinale. *Am. J. Digest. Dis.* 940, 7-37

The alimentary canal may become infected with the virus of lymphogranuloma inguinale through the rectal or oral routes. Attention is directed to abnormal sex practices, coitus analis and beccalis, as possible sources of this infection. Epidemiological and clinical evidence indicate the saprophytism of the virus, and carriers of latent or attenuated elements of the virus may possibly transmit it through the oral route directly by kissing or indirectly through cutlery. Numerous authors have reported infection of the oral and pharyngeal structures by the virus of lymphogranuloma inguinale and all of these infections have been related to abnormal sex practices. Early manifestation of the oral disease are microchancres of the lips and tongue, stomatitis, glossitis, pharyngitis, and tonsillitis. The lips of 3 of 3 prostitutes studied, who habitually practiced "suctio penis" revealed suggestive lesions and all had positive skin reaction to the Frei test. On the basis of biological tests and histopathological findings it may be declared that acute and chronic lesions of lymphogranulomatous nature exist in the mouth.

The question then arises as to whether constant swallowing of the virus is capable of infecting the lower alimentary canal and whether the infection proceeds along the mucosa by contiguity or by transmission through the submucous lymphatics. The virus is resistant to physical and chemical agents and it appears extremely likely that allowed virus can produce infection. In cases of floerretocolitis contiguous ascending mucous infection from primitive rectal focus seems unlikely. The predilection of

the virus for lymphatic structures makes lymphatic progression seem possible. Acute and chronic lymphogranulomatous lesions of the esophagus and stomach probably exist but there is no positive clinical evidence to prove it. Certain duodenal or periduodenal lesions may be lymphogranulomatous in nature but pathological evidence is lacking. Case reports of gastric and duodenal lesions suggesting a lymphogranulomatous etiology are presented but are not conclusive.

The relationship between regional ileitis and ileo rectocolitis, on the one hand, and lymphogranuloma, on the other, cannot be constantly demonstrated, but the authors have found visible forms of the virus of lymphogranuloma inguinale in the intestinal lesions in a number of such cases. They are convinced that the virus of lymphogranuloma inguinale can, through the oral route, infect any part of the alimentary canal.

Rectal infection occurs directly from its interior, or indirectly from primitive genital foci. Again abnormal sex practices are associated, pederasty in men and anal coitus in women being factors in direct rectogenous infection. The virus penetrates the deeper layers through dermomucous abrasures of the anus or through inflamed mucosa. It spreads along the perianal and perirectal lymphatics. This type of infection is usually accompanied by perianal and rectal vegetations which contain large numbers of granulocorpuscular forms of the virus. Perianal abscesses and sinuses develop which in the early period are tuberculoid in nature and in the later period become intensely inflammatory because of secondary pyogenic infection. The importance of deep lymphatic stasis in the production of rupture of the lymphatics, which in turn produces foci of lymphogranulomatous disease, is emphasized as well as the observation that the deep lymph nodes seldom break down. Rectal strictures are situated low in rectogenous infections, while in the lymphatic type of spread in men, they are most common in the upper and middle thirds of the rectum. In women rectal strictures of lymphatic origin are high, low, or intermediate.

The peritoneum may be involved, because of its relationship to the alimentary canal, and give signs of acute peritonitis. Careful study of the ileum and colon should be carried out before radical operation for a rectal lesion is considered. Precipitate surgical procedures should be avoided and surgery withheld until adequate medical treatment has been tried.

JOHN L. LINDQUIST, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Greene, C. H., Hotz, R., Carter, R. F., and Twiss, J. R. The Postoperative Concentration of Bile Salts in Human Bile. *Am J Surg*, 1940, 49, 64.

The authors studied the postoperative changes in the concentration of bile salts in the bile in a series of surgical patients following drainage of the com-

mon bile duct through a T-tube. When the patient gave no evidence of hepatic disease, or the disease was minimal, there was a temporary reduction in the concentration of bile salts in the bile, followed by a progressive return to normal levels after two or three days. This drop was interpreted as being due to such factors as the type and duration of anesthesia, the local and constitutional effects of operative trauma, the degree of preoperative biliary obstruction with hydrohepatosis, and similar conditions.

The rapidity of the postoperative return toward a normal concentration of the bile salts in the bile and the maximal concentration attained during the period of observation were, in general, inversely proportional to the degree of hepatic damage. Evidence is presented that such factors as systemic infection, cholangitis, depletion of the bile salts because of prolonged drainage, and an inadequate supply of carbohyrate will reduce the concentration of bile salts in the bile, presumably as a result of functional contrasted to structural changes.

The multiplicity of factors which apparently affect the functional ability of the liver, and, as a consequence, the concentration of bile salts in the bile correspondingly increase the difficulty of determining the factors responsible for the changes in an individual case.

Evidence was obtained which suggested that in some instances the common bile duct may concentrate the bile passing through it in the same manner as the normal gall bladder concentrates bile.

The continued failure of the liver to secrete bile salts in the bile is evidence of severe functional disturbance, and therefore it is of serious prognostic import.

SAMUEL KAHN, M.D.

Berman, A. L., Snapp, E., Ivy, A. C., and Atkinson, J. The Effect of Long-Continued Ingestion of Oxidized Bile Acids on the Dog and Rat. *Am J Digestive Dis*, 1940, 7, 280.

Various oxidized bile preparations were given orally in relatively large doses to dogs for from three to seven months and to rats for one month. Evidence was obtained which indicated that these preparations were as toxic as the state of the animals apparently revealed. The bromsulfalein clearance was determined, the total fat and glycogen content of the liver was analyzed, and a histologic study was made of sections of the liver and kidneys.

RICHARD J. BENNETT, JR., M.D.

Berman, A. L., Snapp, E., Ivy, A. C., Atkinson, J., and Hough, V. S. The Effect of Various Bile Acids on the Volume and Certain Constituents of Bile. *Am J Digest Dis*, 1940, 7, 333.

The purpose of this investigation was to study the choleric effect of different bile acids with the idea of ascertaining the relation of structure to choleresis, of determining the effect of different bile acids on the composition of the bile, and of determining, if possible, how the body metabolizes oxidized bile acids.

From this work it appears that the "natural" ox-bile salt produce bile quite different chemically and physically from that produced by dehydrocholic acid and unconjugated ketocholonic acids.

The unconjugated oxidized bile acids, and the dehydrocholic and ketocholonic acids are definitely preferable per unit weight for hydrocholeresis. The bile ducts obviously can be flushed, but the authors know of no direct evidence showing that any type of choleresis "flushes out the gall bladder."

The pertinent chemistry of the various bile acids is reviewed.

Three kinds of bile-acid preparations were used: (1) unconjugated conjugated bile acids; (2) oxidized conjugated bile acids; and (3) oxidized unconjugated bile acids, each of these being used in the form of a well known commercial preparation. Bile was assayed chemically for cholic acid, keto-reacting substances, cholesterol, pigment, non-volatile solids, specific gravity and viscosity. A standard control was determined from dogs receiving a controlled diet but no bile or bile acids. These dogs secreted 33 mgm. of keto-reacting substance in the bile daily which was expressed as trinketocholonic acid, or 52.6 mgm. of keto groups per day.

When an increase in bile volume output was produced by giving "natural" ox-bile salts, a proportional increase in the excretion of keto-reacting substances occurred. On the average, 1 per cent of the cholic acid in ox-bile salts is "lost."

When nonoxidized conjugated bile salts are given orally, 90 per cent of the cholic acid is recovered in the bile and usually within eight hours. When oxidized bile salts of any sort are given, only from 0 to 37 per cent are recovered daily. After the administration is discontinued, oxidized bile acid is excreted for from one to five days and total recovery of from 5 to 5 per cent is made. It is clear that the liver or body handles oxidized bile acids somewhat differently from unoxidized bile acids.

Oxidized unconjugated bile acids provoked a marked hydrocholeresis. Oxidized conjugated bile acids caused a moderate increase in bile volume output. The nonoxidized conjugated bile acids, taurocholic and glycolic acids as found in ox-bile, caused a moderate increase in bile volume output. The combination of glycine or taurine with ketocholonic acid, suppresses the hydrocholeresis effect of the keto acid.

The administration of oxidized bile acids did not uniformly increase or decrease the output of natural bile salts.

The administration of bile acids did not significantly affect the bile-pigment output. Cholesterol output was increased with all the bile acids studied except dehydrocholic acid.

One of the oxidized unconjugated preparations of dehydrocholic acid or ketocholonic acids will flush the bile ducts (not the gall bladder) with relatively copious quantities of this bile. To increase the volume output of bile by the liver and at the same time increase the concentration of bile salts that naturally

predominate in human bile a preparation containing "natural" ox-bile salts should be used.

The wisdom of bile salt therapy applied to the liver in hepatitis or during recovery from obstruction is not suggested.

Rk. 10 J. Br. M. J. 1940

Watson, C. J. Regurgitation Jaundice: Clinical Differentiation of the Common Forms, with Particular Reference to the Degree of Biliary Obstruction. *J. Am. M. Ass.* 1940, 1247.

The author points out that regurgitation of bile from the biliary tract probably occurs in the small biliary capillaries because of rupture or diapedesis. This permits bile to reach the lymph vessels and thus enter the blood stream. One hundred and eighty-five cases of regurgitation jaundice are grouped into 3 large classes: cancerous, calculous, and parenchymal. More common cases resulting from benign strictures of the common bile duct, chronic pancreatitis, or benign tumors and cysts must be considered separately.

Complete obstruction as present in 0 per cent of patients in the cancerous group, with less than 5 mgm. of urobilinogen in the feces daily; of these, 55 per cent had less than 1 mgm. of urobilinogen in the feces daily. In only 7 per cent of the calculous and parenchymal groups was the feces urobilinogen below 1 mgm. daily and in 5 per cent of these two groups the feces urobilinogen was less than 5 mgm. daily. Urobilinogen in the urine was found to be an useful means of detecting the degree of biliary obstruction. Traumatic strictures of the common bile duct may or may not be accompanied by complete biliary obstruction.

Although theicter index tends to be over 10 in cancerous cases, not less than 10 in calculous cases there is sufficient overlapping to make this an unreliable guide for diagnosis. The variation of the icter index in parenchymal cases is even greater. Changes in the intensity of the icter index due to the rate of blood destruction and replacement and the loss of bilirubin in the urine are pointed out. Jaundice may be slight or absent in metastatic carcinoma.

Urobilinogenuria occurring after the first few days of jaundice is believed to be strong evidence against cancer of the extrahepatic biliary tract. Marked urobilinogenuria is often observed in calculous or parenchymal groups. These levels are not high in calculous cases unless there is associated acute infection of the biliary tract. Clinical points which aid in the differentiation of the parenchymal group of cases are the presence of the amine odor (fetor hepaticus), spider skin, small liver palpable spleen and ascites. THOMAS C. DORCLAND, M.D.

Calcegiun, B. The Biological Treatment of Hydatid Cyst (Terapèutica biologica de la hidatidom). *Rel. y trab. Acad. argent. de cienc.* 1940, 34, 507.

The author has attempted to treat hydatid cyst biologically by means of the injection of hydatid liquid in increasing quantities, very high doses have

ing been given with perfect tolerance. He maintains that he has not observed any toxic action and that there was always an improvement in the patient's general condition, with an increase in weight and disappearance of the anemia. He believes that the anti-hydatid vaccination works indirectly, that it neutralizes the action of toxic substances secreted by the parasite. Devé has called the author's attention to the fact that the good results obtained in secondary peritoneal hydatidosis could be attributed to the spontaneous regressive tendency of some of the cysts because the vitality of the cysts is not always the same, some disappear while others continue their development.

In 4 cases of multiple secondary hydatidosis which were subjected to this treatment, the condition of the patient was very much improved.

The author reports a new observation in which a voluminous hydatid cyst of the liver occupied the right lobe. There was a clear deformity of the diaphragm and palpation of the hypochondrium was positive. The distention of the hemithorax was important and percussion produced a strong fremitus. The injection of the hydatid liquid was very successful in this case, the volume of the cyst diminishing gradually, the tumor in the hypochondrium disappeared, and the difference in size between the right and the left hemithorax was reduced from 3.5 cm. to 0.5 cm. The patient gained 5.5 kgm., and the blood count increased from 3,920,000 to 4,340,000. The eosinophils increased from 9 per cent to 11 per cent at the time of writing. The Ghedini reaction, which was negative before the vaccination, became strongly positive.

The roentgenological findings in this case were very revealing. In the first roentgenogram the diaphragm showed a definite deformity, which seemed to indicate the superior pole of the cyst. A new roentgenogram, made after six months of treatment, showed an evident reduction of the tumor. During the course of the treatment there were two very intense pericystic reactions.

There are several possible explanations of these facts:

1. The regression of the cyst might have been spontaneous and have had no relation to the treatment. However, the author has observed the same course in 5 different patients, a fact which indicates a possible connection between the treatment and the involution of the cyst.

2. There might have been a spontaneous rupture of the cyst with elimination of the contents to the exterior or to any of the neighboring cavities. The patient was under close observation, however, and there were no accidents to justify this explanation.

3. In answer to the theory of a possible disappearance of the cyst because of infection, the author states that there were no signs of infection but only a few periods of fever with no modification of the hematological findings.

4. The author considers vaccination as the most plausible explanation of regression of the hydatid

cyst. The course of the treatment, the amelioration of the patient's general condition, the humoral reaction, and the analogy to the findings in other patients support this view.

The author arrives at the conclusion that the biological treatment of hydatidosis produces favorable reactions which must be carefully observed with a view to practical application. Even though his experiments have not yet been proved by autopsy or operation, he feels justified in calling the Academy's attention to his findings. At the present time the author is continuing his experiments with the use of concentrated hydatid liquid; this seems to produce better and quicker results in smaller doses with less local and general reaction. HECTOR MARINO, M.D.

Glenn, F. Exploration of the Common Bile Duct *Ann. Surg.*, 1940, 112, 64

An analysis is given of 112 cases in which exploration of the common duct was done for obstruction. Twenty-two of the patients had acute cholecystitis at the time of operation, 78 had chronic cholecystitis, and 12 had stenosis or obliteration of the common duct.

The common duct was routinely opened and searched for obstruction in all cases (a) in which there were stones palpable in the duct, (b) in which there was a history of progressive jaundice or repeated attacks of jaundice, and (c) in which the common duct was dilated. It has been noted that induration of the head of the pancreas may be caused by stones in the ampulla of Vater and, therefore, this sign is considered, in certain cases, as an indication for exploration. The indurated common duct, found in acute and subacute inflammation of the gall bladder and associated with only a mild degree of jaundice (an icteric index of 30 or less), was generally not opened for it seldom contains stones. However, if the duct was distended as well as indurated, it was explored. Patients with cholecystitis and cholelithiasis who gave a history of repeated attacks of jaundice were explored with particular care not to overlook stones, for in these cases stones were frequently found in the hepatic ducts.

Stones were located and removed in 60 cases. In 7 other cases, there was stenosis or complete obliteration of the common duct. Therefore, in 67 of the 112 patients the cause of the obstruction of the common duct was found and corrected. In the remaining 45, 2 per cent of the cases, the exploration was of questionable therapeutic value.

In the 12 cases in which operation was performed for stenosis of the common duct, the patients had previously had a cholecystectomy or an exploration of the common duct. In 5 of these, a definite history of injury to the duct at a previous operation was obtained. In 3 others a technical error, apparently, had been overlooked by the operator. In another instance, an exhaustive search at the secondary operation revealed only a bulb-like sacculation at the junction of the hepatic ducts in place of the common duct.

Although marked stenosis appeared to be the principal cause of obstruction of the duct in this group of cases there were 5 in which stones were found and removed. In 1 patient the stenosis of the common duct appeared to be caused by distortion, which resulted from contracture of the scar of an old lumb tract.

One method employed in the treatment of stenosis is described and illustrated. It consists of excision of the constricted portion of the duct and reestablishment of its continuity by an end-to-end anastomosis. The proximal and distal ends of the duct are mobilized by dissection for distance of 4 cm. Three arterial sutures are placed in the wall of each stump, and by tension on these the resected ends of the duct are approximated. An incision is made in the distal portion of the duct to introduce T-tube. The proximal end of this tube will extend across the suture line. Interrupted arterial silk sutures are used to make the anastomosis between the two ends of the duct. The placing of these sutures is facilitated by stay sutures which are introduced earlier.

A second method used by the writer in treating stenosis of the common duct is that of a latero-transverse anastomosis between the biliary tract and the duodenum to reestablish passage for the bile.

It is suggested that the bile from biliary fistula, in cases of obstruction of the common duct, be collected, and that the patient take it between meals in five or six equal parts during the twenty-four hours.

An obstruction in the distal portion of the common duct which persists after exploration and the removal of stones is not an infrequent finding. It is believed to be caused either by edema or palsy in the lower portion of the duct, or at the ampulla. Dilatation of the duct is recommended, and from 1 to 5 ccm. of pressure, obtained by means of an adjustable burette filled with saline solution and connected to the common-duct drainage tube should be used.

The administration of vitamin K and bile salts for the prevention and control of hemorrhage in jaundice is also discussed.

Common-duct stones are more often associated with the late, rather than the early stages of disease of the gall bladder. Interruption of the progress of such disease by early cholecystectomy may be expected to prevent the formation of stones in the common duct.

The need for careful surgical technique in cholecystectomy to avoid injury to the biliary ducts, is emphasized. Stricture and distortion of the common duct may also result from faulty placement of the drains. It is recommended that the rubber drainage tube in the common duct should not be attached either to the skin or the dressing, for with the changes which may occur in the intra-abdominal pressure and in the position of the organs, leeway for the adjustment of this tube to new positions must be left, or the common duct may be hooked up and distorted when the wound heals.

The author describes various technical methods to avoid overlooking stones in the common duct, among them, careful palpation, catheterization, the passage of scopes and forceps, and irrigation. The use of a small special electric light which may be passed into the duct is suggested, and also x-ray visualization of the biliary tree on the operating table by means of opaque injections. However no method is infallible, and calculi may be left behind even when all known devices to locate them have been employed.

SAMUEL H. KRAM, M.D.

Ryder, L., and Young, E. L.: Carcinoma of the Ampulla of Vater. *New England J Med* 1940, 233, 90.

Carcinoma of the ampulla of Vater is relatively rare, and the clinical diagnosis is usually that of carcinoma of the head of the pancreas. The expectation of life is very short, because of the widespread changes resulting from the obstruction of the bile and pancreatic ducts.

The incidence of this carcinoma is less than 0.05 per cent. The majority of patients are over forty years of age, and the disease occurs more commonly in males than in females, in the proportion of 3:1. Symptoms of the condition are those of obstruction of the bile and pancreatic ducts, in addition to duodenal ulceration. Painless jaundice, anorexia, weight loss, diarrhea, and epigastric distress may be present. In about 50 per cent of the cases, however more or less painful jaundice occurs. Signs which may be present are distended gall bladder, palpable liver jaundice, and emaciation. A definite diagnosis cannot be made clinically.

Operability of the tumor is frequent because of the slow growth and tendency toward late metastasis. However surgical technical difficulties are great. The mortality varies from 3 to 70 per cent. Recurrences after radical extirpation have been frequent. The operative procedures of choice are (1) transduodenal resection with reimplantation of the bile and pancreatic ducts and (2) Whipple's two-stage procedure. If the tumor is small, papillary, more or less pedunculated, and without infiltration of its base the former procedure is advisable. If however these conditions do not exist, the latter procedure is indicated. Whipple procedure consists of first-stage posterior gastro-enterostomy, ligation and section of the common duct below the cystic duct, and cholecystojejunostomy. Three or four weeks later the second stage is performed, this consists of ligation of the pancreaticoduodenal and gastroduodenal arteries, resection of the descending portion of the duodenum, and V-shaped excision of the head of the pancreas and the common duct, with ligation of the cut ends of the pancreatic ducts and suturing of the cut surfaces of the pancreas with fine silk.

Pre-operatively high carbohydrate diet, glucose infusions and knowledge of the bleeding and clotting times as well as of the prothrombin level are essential. Vitamin K and bile salts are given routinely.

ly and are continued postoperatively. Transfusions are given as indicated.

The authors report a case in detail in which the patient survived three years after a one stage transduodenal resection of a carcinoma of the ampulla. The common bile duct and pancreatic ducts were reimplanted into the duodenum. The pathological diagnosis was malignant adenoma (adenocarcinoma) growing fairly slowly. Convalescence was satisfactory, but prolonged. Annual follow-up studies reveal an apparent cure.

LUTHER H. WOLFE, M.D.

Ladd, W. E., and Gross, R. E. **Surgical Anastomoses Between the Biliary and Intestinal Tracts of Children.** *Ann Surg*, 1940, 112: 51.

It is the purpose of this communication to summarize the late findings in the authors' series of patients with a congenital abnormality of the bile passages, which they have treated by surgically joining the biliary and intestinal systems. To date, 45 babies with biliary atresia have been operated upon in the Children's Hospital, Boston, Massachusetts. Nine of these were found to be operable, and in 8 patients a blind hepatic duct, a blind common duct, or the gall bladder was anastomosed with the stomach or duodenum. Three of these babies died shortly after operation, 1 expiring on the second day, of hemorrhage, 1 on the ninth day, of peritonitis, and 1 at the end of three months, from perforation of the duodenum by an intussuscepting tube which led to fatal peritonitis. Of the entire group, then, 5 have survived. The authors have also personally encountered 6 children with congenital cystic dilatation of the common bile duct, 5 of whom were treated by drainage of the biliary tract into the stomach or duodenum.

The two groups discussed now make available for study 10 patients in whom there has been a surgical anastomosis between the biliary and intestinal systems.

The types of congenital anomalies encountered by the authors in their series of cases are illustrated in Figures 1 and 2. The reader is referred to the original article for the detailed description of the operative technique employed in dealing with these congenital anomalies.

The 10 surviving patients have all been interviewed in 1940 and their present condition has been evaluated. They were reviewed at nineteen, sixteen, fourteen, thirteen, eleven, eight, six, five, and five years, respectively, after operation, and the findings are summarized as follows:

One individual has had recurring cholangitis, but the cholecystoduodenostomy in this case was performed with a Murphy button. In the 9 other patients, the hepatic duct, common duct, or gall bladder was carefully anastomosed to the stomach and duodenum, and none of these 9 has had cholangitis at any time. The livers in these individuals all showed marked obstructive cirrhosis at the time of operation, but none has shown any insufficiency since operation. It therefore appears that the liver has

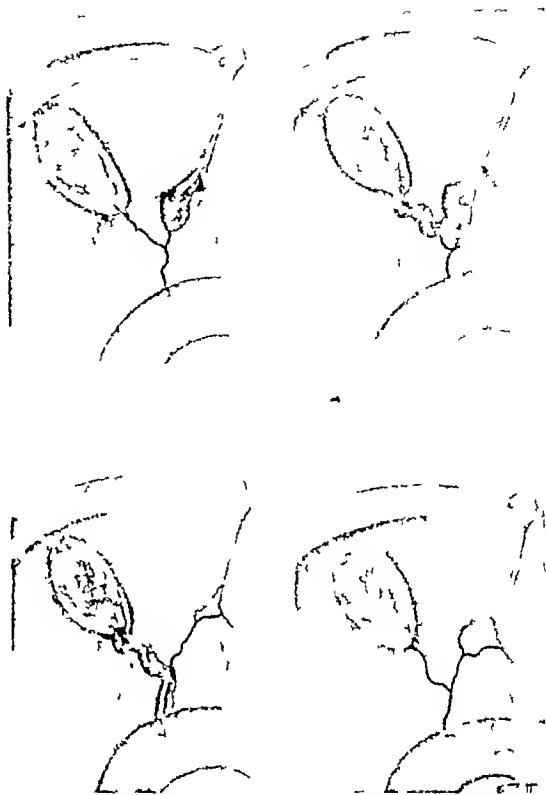


Fig. 1. Types of atresia of the extrabiliary system found in 45 cases which were surgically explored. Above: Types of cases which are operable by joining the blind hepatic or common duct to the duodenum. Below: Types of cases which are inoperable and no relief of jaundice can be instituted.

remarkable powers of regeneration under these circumstances, and that this repair can take place without the occurrence of subsequent portal obstruction.

In conclusion, the authors state, "A study of this material leads us to believe that it is not necessary to attempt prevention of ascending biliary infection by inserting biliary ducts into the intestine in an oblique or valve like fashion. Nor is it essential to insert a bile duct into a clean side arm of intestine to prevent soiling of the biliary passages. At least these statements hold true for patients in the childhood group. We are convinced that successful issue in these cases depends upon the care with which the anastomosis is performed. The operative procedure must be performed so that mucous membrane of the bile duct or gall bladder is accurately apposed to the mucosa of the stomach or duodenum, and no stenosis must exist at the anastomotic site. Under these conditions the long-time follow-up results of anastomoses between biliary and alimentary tract have shown very satisfactory results in our hands."



Fig. Drawing showing congenital cystic dilatation of the common bile duct. The dilatation is due either to stenosis at the lower end of the duct or else to an achalasia which prevents proper function of the sphincter of Oddi. Surgical treatment consists of joining the gall bladder to the intestine or preferably anastomosing the common duct to the duodenum. (Courtesy of J. B. Lippincott Co.)

The case histories of the authors series of cases are also recorded with treatment details.

SUCCILL H. KLEIN, M.D.

Cole, W. H., and How, J. S. The Pancreaticobiliary Syndrome. *Surgery* 94, 8-9

Up to the present time comparatively few records of typical cases of fatty liver and pancreatic fibrosis in adults appear in the literature. Five cases have been presented recently, by various investigators, and sixth is reported in the present article. A severe grade of fatty infiltration of the liver and fibrosis of the pancreas were characteristic of all 6 cases. Both experimental and clinical evidence indicated that the fatty infiltration of the liver was always secondary to severe pancreatic insufficiency incident to pancreatic atrophy and fibrosis. Undoubtedly the pancreatic fibrosis might have been caused by numerous factors, including any process which obstructed the ducts.

The authors believe that the pancreatic stenosis of infancy and childhood is identical with the disease described more recently in the 6 adult cases. Both have certain manifestations in common, such as diarrhea with foul bulky fatty stools, cachexia, anorexia, nausea, vomiting, epigastric distress, and loss of weight. Osteoporosis seems to be about the only symptom not common to both groups. This condition occasionally seen in children suffering from the disease is traceable to the growth demands of childhood. Even greater similarity is seen in the pathological features of both of the condition under discussion. Unquestionably the etiological factors in both are variable. In children, 3 possible etiological factors may be responsible, namely congenital malformation of duct, fetal pancreatitis and vitamin deficiency. In adults, pancreatic stones or gall

bladder disease may be responsible. More study is necessary before it can be definitely ascertained whether or not some additional factor such as deficiency of some other glandular organ, play necessary role in the development of the disease. Considerable variation is noted in the manifestations of the disease, but this is true of other diseases also.

It now seems quite possible to make an accurate diagnosis of the condition with the clinical data obtained from study of the 6 cases herein discussed. Laboratory tests, together with liver-function tests and urine examination, should prove helpful. Usually the blood cholesterol is below normal. A definite tendency toward lowering of the blood-protein level with shift toward reversal of the albumin-globulin ratio usually occurs.

One of the most helpful features in the treatment of the disease is lipocalic therapy. This may be even curative provided its administration is maintained at proper intervals. High carbohydrate and protein diets may prove helpful. The use of salyrgan and other drugs is indicated in symptomatic therapy. All of these indications apply also to pancreatic stenosis of childhood especially the lipocalic therapy.

MARKUS J. SCHWARTZ, M.D.

Roussicot, L. M. The Late Phase of Congestive Splenomegaly (Banti Syndrome) with Hematemesis, but Without Cirrhosis of the Liver. *Surgery* 94, 8-9

The term Banti disease or "Banti syndrome" is confusing and misleading particularly with respect to the cause, clinical course, and treatment of the disease. "Congestive splenomegaly" as suggested by Larrabee is a preferable term.

The usual intrahepatic lesion producing congestive splenomegaly is cirrhosis of the liver. In the present article 5 cases of congestive splenomegaly due to extrahepatic obstructive lesions are reported. Although the characteristic features of Banti syndrome, particularly the presumably late symptom of hematemesis, were present in all of these cases, nevertheless coexistent liver cirrhosis, as notably absent. The lack of hepatic involvement, as established in all of the cases by most of the available methods, such as various liver-function tests carried out before operation, gross examination of the liver at operation, and liver biopsy on one or more occasions in the same patient. Furthermore, there is no evidence of subsequent liver cirrhosis following operation as established by laboratory studies for periods varying up to nineteen years after operation. In 4 instances this lack of hepatic involvement, as demonstrated at autopsy as well. The complete absence of liver cirrhosis in this group of cases contradicts the sequence as described by Banti of a primary splenomegaly and a subsequent cirrhosis of the liver due to a hypothetical toxic agent. The

author believes that the cause of the splenomegaly can be explained entirely on a mechanical basis with a primary obstructive factor in the portal bed and an associated portal hypertension.

A variety of extrahepatic lesions responsible for venous stasis is listed. In 4 instances the lesions were recognized at operation. In these 4 cases pressures in the splenic vein were determined and a definite venous hypertension was recorded. The extrahepatic obstructive lesions were demonstrated at autopsy in 4 other cases. The author points out that failure to discover an obstructive factor in the remaining 7 cases is not necessarily a weakness in his hypothesis but is due rather to the technical difficulties involved in an operative examination of the portal venous bed away from the splenic hilum, particularly behind the head of the pancreas.

Anomalies in the portal system are frequent. The author calls attention to the variety of anatomical venous patterns. This accounts for the vagaries and alterations in the clinical behavior of patients following splenectomy. Two factors profoundly influence the prognosis and clinical behavior in cases of congestive splenomegaly due to extrahepatic obstructive lesions. These are (1) the site of the obstructive lesion, and (2) variants in the anatomy of the venous pattern. MATTHIAS J. SEIFERT, M.D.

MISCELLANEOUS

Lockwood, J. S., and Ravdin, I. S. The Prophylactic Use of Sulfanilamide In Abdominal Surgery. *Surger*, 1940, 8: 43.

The risk of postoperative peritonitis in surgery has probably been substantially lowered by the institution of a number of improvements in surgical technique and management. Among these improvements the most important are (1) atraumatic methods of anastomosis and the use of silk for seroseros sutures, (2) preliminary enterostomy with preoperative decompression and cleansing of the bowel, (3) intubation with the Miller-Abbott double lumen tube to minimize tension proximal to the suture line, and (4) mobilization of the peritoneal defense prior to a radical operation.

In spite of these important advances in technique, peritonitis remains an important cause of death following operative procedures on the large intestine.

Peritonitis of intestinal origin is a polymicrobial infection, and the bacteria concerned in its production are relatively, but not entirely, resistant to sulfanilamide bacteriostasis. This bacteriostatic effect may become significant in the peritoneal defense against postoperative peritonitis if an adequate concentration of drug is present, if the number of contaminating organisms is small, if tissue necrosis is minimal, and if the usual cellular defense is present.

During 1938, the authors started using sulfanilamide in the treatment of inflammatory and traumatic bowel perforations. They were so impressed with the recovery of some of the patients that they began to use this drug prophylactically in all of their bowel resections. Although clinical experience is as yet insufficient to warrant final conclusions as to the effectiveness of sulfanilamide in the prevention of peritonitis, the authors present a series of sulfanilamide treated cases, none of which showed evidence of spreading peritonitis after the institution of sulfanilamide therapy. This series consisted of 22 consecutive cases of colon resections of various types (16 for carcinoma and 6 for non malignant lesions).

The authors are of the impression that under special experimental or pathological conditions which favor drug action, sulfanilamide may have some degree of anti bacterial effect against almost all species of pathogenic bacteria, and that the pathological character of the lesion is of greater importance in conditioning the magnitude of the drug effect than the considerations of bacteriological specificity. In peritonitis, a minimal drug effect against the intestinal pathogens may serve to augment the natural defenses of the peritoneum to the extent that the balance of factors will become favorable to the host. There is no evidence available to justify the employment of sulfanilamide prophylactically or therapeutically to the exclusion of any other recognized principles or practices of therapy. The authors believe that the weight of experimental and clinical evidence now justifies the use of sulfanilamide as an adjunct to other forms of treatment in the management of threatened or established peritonitis of intestinal origin. SAMUEL H. KLEIN, M.D.

GYNECOLOGY

ADNEAL AND PERIUTERINE CONDITIONS

Marchetti, A. A. Endometrium Like Mucosa Lining the Fallopian Tube. *Am J Obst & Gynec.*, 1910, 40, 69.

The formation of endometrium-like mucosa in the fallopian tube is a tissue abnormality which is infrequently seen and seldom described. It responds to the ovarian hormones in its functional activity just as the endometrium does, even to the point of menstrual desquamation. Two cases with clinical and histopathological findings are reported. The theories of origin are briefly reviewed, and it is concluded that Robert Meyer's theory of heteroplasia explains better than any other the process of its development.

The differential characteristics are enumerated and contrasted with several other pathological lesions of the tube. Endometrium-like mucosa in the tube is of little clinical value. Interest centers chiefly upon its biological significance.

Edward L. Cornell, M.D.

EXTERNAL GENITALIA

Leitch, W. G. and Crutchfield, L. G. On Thrush, with Special Reference to Vaginal Thrush. *Edinburgh M J*, 1903, 47, 369.

The authors recommend return to the long established name *Oidium albicans* for the commonest species of thrush-producing organism.

A diagnosis of thrush infection can be made upon finding the septate-mycelium with buds or blastospores often incorrectly called yeasts, which are situated generally near the septa but occasionally found on any part of the mycelium, or with free spores as single individuals or more characteristically in groups. The mycelium and blastospores can be demonstrated either in wet films made directly from the affected parts, or in dried films stained by Gram's method. Occasionally cultures may be helpful.

Oidium albicans is the cause of thrush whether the lesions are situated in the vagina or the mouth, or on the skin.

It is believed that pregnant women are more susceptible to this infection than non-pregnant women. Another condition favoring the development of thrush infection is the presence of glycosuria. Delivery usually leads to complete relief in pregnant women, and menstruation generally has the same effect in the non-pregnant.

Extension of the disease to unusual sites has been observed often, and is generally associated with a long persistence of infection in the normal habitat of the parasite that is, in the mouth or vagina.

Forty-nine cases occurred among 200 consecutive women attending an antenatal clinic for leucorrhoea.

The infection may be easily overlooked unless the parasite is carefully sought because the symptoms may be trivial.

The presence of the parasite in the vagina seems to depend in large part on the hydrogen-ion concentration of the vaginal contents. The mean pH reading in 33 cases was 4.8, that is, slightly less acid reaction than that found in normal pregnant women. The mean pH reading of 37 normal pregnant women was found to be 4.4. The pH reading of the vaginal contents of 34 pregnant women infected with trichomonas vaginalis was found to be 5.3.

The pH reaction of the vaginal contents is not easily altered for any length of time by the application of acids or alkalis therefore more study is necessary before a satisfactory line of treatment can be adapted for all cases. D. Wm. G. Morrow, M.D.

MISCELLANEOUS

Boston, C. L. Pregnanliol Determination as an Aid in Clinical Diagnosis. *Am J Obst & Gynec*, 1903, 40, 103.

Pregnanliol is defined as an excretion product of the corpus-luteum hormone progesterone. Its synthesis as sodium pregnanliol glyceroidate probably occurs in the liver. Its metabolism and excretion are not dependent upon the testes or ovaries, as is shown by injection experiments on men and hysterectomized women.

The urine of monkeys, cats, and rabbits does not contain pregnanliol either normally during pregnancy or after progesterone injections. The greatest yield and purest form of pregnanliol glyceroidate occurs in the urine of pregnancy. No pregnant patients have been observed who do not excrete pregnanliol glyceroidate. Therefore, the negative diagnosis of pregnancy may be made as a result of negative pregnanliol determination. Pregnanliol is present in small amounts the *non* during the latter half of the menstrual cycle in normal women. Although the excretion during pregnancy is greater than that during the luteal phase of the menstrual cycle, diagnosis of pregnancy cannot be made on this basis because the quantitative determination is not sufficiently accurate. Five patients with habitual abortion were tested for pregnanliol excretion during subsequent pregnancies. One of them aborted spontaneously during the course of progesterone therapy. She showed unusually low pregnanliol excretion.

Seventy-eight simultaneous pregnanliol determinations and endometrial biopsies were made on patients, most of whom were in the tertiary clinic. These tests were made in order to ascertain the accuracy of these two methods of determining gestational activity. It is apparent that pregnanliol is excreted during the time that the endo-

metrium is being activated to a secretory phase and only during that time. There are so many factors controlling the excretion of pregnandiol glucuronide that the quantitative result is liable to vary. Therefore, diagnosis cannot be made on a basis of quantitative differences in excretion.

EDWARD L. CORNELL, M D

Williams, P F, Griffith, G C, and Fralin, F G
The Relation of Vitamin B₁ to the Reproductive Cycle. *Am J Obst & Gynec*, 1940, 40 181

Studies of the food records showed that one-third of a group of 91 pregnant women were not receiving an adequate amount of Vitamin B₁, calculated on a ratio of 15 international units per 100 calories. Practically two thirds of the group were receiving less than 500 units of Vitamin B₁, the standard used by Stiebeling and Phipard. There was some positive correlation between the inadequacy of the intake and deficiency symptoms, such as excessive nausea and vomiting, fatigue, and paresthesias. The margin of safety above a beriberi level, as calculated on a Cowgill prediction chart, ranged from 0 to 180 per cent. One-fourth had a margin of safety under 50 per cent, and two thirds presented one under 100 per cent. The electrocardiograms of 8 women in the group showed changes signifying a Vitamin B₁ deficiency. There was no positive correlation between these electrocardiograms and the adequacy of the Vitamin B₁ intake.

EDWARD L. CORNELL, M D

Salmon, U J, Gelst, S H, and Walter, R I
Evaluation of Stilbestrol as a Therapeutic Estrogen. *Am J Obst & Gynec*, 1940, 40 243

The biological and therapeutic properties of stilbestrol were studied in a series of 45 cases. These studies included (a) an evaluation of its effect on the vaginal smear, vaginal mucosa, and endometrium, (b) the capacity of stilbestrol to inhibit the excessive gonadotropic hormone excretion in the menopausal patient, and (c) its effectiveness in relieving the symptoms of the menopause syndrome. These studies have shown that (a) stilbestrol has an estrogen like effect on the human vaginal mucous membrane and endometrium, (b) if sufficient stilbestrol is administered, it appears to inhibit the

excessive excretion of gonadotropic hormone in the menopause patient, and (c) stilbestrol relieves the hot flushes of the menopause, but it does not impart to the patient the feeling of well-being and nervous stability that usually result from treatment with the natural estrogens.

Toxic symptoms were observed in 64 per cent of the 45 patients. Those most commonly noted were nausea, vomiting, and vertigo. The high incidence of toxic symptoms militates seriously against the usefulness of stilbestrol as a therapeutic agent.

EDWARD L. CORNELL, M D

Gordon, C A, and Rosenthal, A H. The Use of Sulfanilamide in Obstetrics and Gynecology. *Am J Obst & Gynec*, 1940, 40 211

In minor febrile disturbances chemotherapy should not be used. In severe intrapartum and puerperal infections of the genital tract, sulfanilamide should be given provided the patient is in a hospital where its administration may be properly controlled. Bacteriological diagnosis need not precede therapy, yet early recognition of the infective agent is important. Since it is probable that sulfanilamide is effective only when the streptococcus hemolyticus Group A is present, its administration should not be continued for longer than a week, if another organism has been isolated.

In mastitis not responding to ordinary treatment, chemotherapy should be tried. In pyelitis it is at least as effective as other methods of drug treatment. A large series of cases followed over a considerable period of time will be necessary before positive statements can be made. Sulfanilamide should be used in gynecological infections (1) if they are primary gonococcal, (2) if smear or culture is positive with exacerbation or reinfection of old gonococcal infection, and (3) when the streptococcus hemolyticus can be demonstrated as the infective agent.

Sulfanilamide should not be given in cases of cellulitis, pelvic or abdominopelvic abscess, or to patients with acute exacerbations of chronic pelvic infections with tubo ovarian masses when the gonococcus cannot be demonstrated. Evidence accumulates that sulfanilamide should not be given to ambulatory patients.

EDWARD L. CORNELL, M D

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Williams, P. F., Hark, B., and Frahm, F. G. A Nutrition Study in Pregnancy. *Am J Obst & Gynec* 940, 4

In an analysis of the diets of 23 pregnant women, 6 per cent showed Vitamin A below the requirement for pregnancy which is stated as from 6,000 to 11,000 Sherman units. The same women, together with 10 others for whom the authors had no food records, were tested for their dark adaptation time. Thirty-seven and one half per cent gave readings delayed beyond the accepted normal of five minutes. The correlation coefficient between the two types of analysis was not statistically significant. A similar insignificant relationship was seen between the fat intake and dark adaptation time. The administration of Vitamin A in concentrated form in 8 cases was followed by an improvement in the dark adaptation time in 75 per cent of the cases. Ten of 13 delivered patients with febrile morbidity in the puerperium, showed subnormal Vitamin A intake. However, many other women with intakes below the requirement did not show febrile morbidity. The series is considered too small to draw conclusions with reference to the birth weight of the baby and the mother's Vitamin A consumption nor as there any significant relationship between efficient lactation and Vitamin A intake.

It appears from this summary that while there was a marked deficiency of Vitamin A content in the diet (6 per cent of 13 pregnant women) and considerable increase in dark adaptation time (37.5 per cent) yet there was no close relationship between dark adaptation, the process of regaining clear vision in darkness, and the intake of Vitamin A in the diet nor between the Vitamin A intake and certain obstetrical factors in this short series of cases.

EDWARD L. CORVILL, M.D.

Hirst, J. C., and Shoemaker, R. E. Vitamin A in Pregnancy. The Average Capacity According to the Feldman Adaptometer. *Am J Obst & Gynec* 940, 40

Two hundred registered pregnant women under good prenatal control were repeatedly tested for Vitamin A capacity by the Feldman adaptometer. Nine per cent showed at least one reading above five minutes, while only 3 per cent showed repeated abnormal readings and were judged deficient in Vitamin A; 4 per cent were borderline.

Vitamin A deficiencies occurring in the average pregnancy tend to be mild, and are not entirely related to pregnancy. There was a general tendency toward improvement in the Vitamin A status during the pregnancy in these cases, and there were fewer deficiencies than found in general. High findings were due either to the summer season or, most likely

to good prenatal care. There were no significant medical and/or obstetrical complications among the few women who had Vitamin A deficiencies.

If in more pregnancies must be studied before a basis to reliance may be placed upon a subjective test for Vitamin A. EDWARD L. CORVILL, M.D.

Strander, H. J. and Pastore, J. B. Weight Change During Pregnancy and the Puerperium. *Am J Obst & Gynec* 941, 30, 923

A study of the eight changes in 1035 pregnancies is presented. The average curve for normal pregnancy is shown. Standardized curves of percentage change in weight are presented. This offers an easy method of recording eight changes which allow early recognition of abnormalities and permits comparison of cases. Twin pregnancies as well as the various types of toxemia were studied.

The following conclusions can be drawn:

The average increase in weight from the sixth to fortieth week was 35 kgm., or 25 per cent.

The average loss in weight during the week prior to labor was 1 kgm., or 3 per cent. The loss during delivery was 5.55 kgm., or 7.74 per cent. The average loss during the first ten days of the puerperium was 3 kgm., or 5.77 per cent. A further loss of 63 kgm., or 1 per cent, was sustained during the last five weeks of the puerperium. Primiparas, as a rule, do not retain the original eight changes in pregnancy. There is no difference in eight changes between the primipara and the multipara.

The eight gains in twin pregnancy is not excessive, but the loss during delivery and puerperium is definitely increased. In chronic nephritis and classified toxemia there is poor gain in weight. With low reserve kidney pre-eclampsia, and eclampsia there are similar eight changes, differing only in degree. The total gain is decreased but the loss during delivery and puerperium is excessive. This study would tend to include the three forms under one type. Lack of gain during early pregnancy seems to be a significant sign in the eclamptic toxemias. Weight changes seem to substantiate the new classification of toxemias.

The specific eight changes for any woman during normal gestation are proportional to her non-pregnant weight, and for this reason it is essential that weight changes be plotted in such a manner that they may be compared with the normal curves. This may be done by recording the eight changes against the normal eight curves which are presented for 40, 60, and 80 kgm. respectively.

EDWARD L. CORVILL, M.D.

Cope, C. L. The Excretion of Pregnanediol in the Toxemia of Pregnancy. *Lancet* 940, 39, 38

Cope of the University of Oxford presents a study of the excretion of pregnanediol glycoside in

late toxemia of pregnancy His findings, observed in 10 cases uncomplicated by nephritis, failed to reveal any marked diminution of pregnandiol output His results are contrasted with those of Weil (1938) and of Browne, Henry, and Venning (1938) who reported the excretion of very small amounts of pregnandiol glycuromide in such cases Cope states that it would appear that the functional state of neither the liver nor the kidneys provides any theoretical reason for a reduced excretion of pregnandiol glycuromide in toxemia of pregnancy When the excretion is much diminished or absent, it is probably an expression of associated renal functional damage due to a complicating chronic nephritis The author reports 1 case in which pregnandiol was absent in the urine in the last week of pregnancy of a woman with chronic nephritis

WILLARD G. FRENCH, M D

Torpin, R., and Coppedge, W. W. Eclampsia A Review of 350 Cases Stressing Therapy *South M J*, 1940, 33 673

Three hundred and fifty cases of eclampsia were reviewed by the author The incidence was 50 per cent greater in the negroes than in the white women As to age the half decade from fifteen to twenty years included the large majority of both races Eclampsia is more frequent in the primipara In this study there was practically no evidence of cyclic variation in incidence over a period of twenty years and practically none in the monthly incidence Consequently, a relation between the occurrence of the disease and the weather, heat, humidity, and atmospheric changes was not evident

The symptoms in the series of 350 cases of eclampsia were analyzed There was a higher mortality in the negroes than in the white patients

A five-point treatment in eclampsia is outlined

- 1 Two grams of magnesium sulfate should be given intravenously in sterile 10 per cent solution every hour as long as the systolic blood pressure is 160 or more Twenty grams in twenty four hours may be necessary Convulsions must be stopped, if mild with paraldehyde in from 4 to 6 dram doses given rectally and if severe with sodium phenobarbital solution given intravenously only until they are controlled

- 2 Adequate salt-free diet is given

- 3 Thirty five hundred c cm of 5 per cent dextrose in sterile distilled water are given intravenously daily when the patient is in coma Oxygen and blood are administered when such measures are indicated

- 4 Absolute rest is required The foot of the bed should be elevated, and a duodenal nasal tube should be used with constant suction when the patient is comatose to prevent aspiration pneumonia

- 5 When the condition improves or becomes stationary, labor should be induced by rupture of the membranes, if the pregnancy is at term, or by insertion of a catheter or bag if not at term

J THORNWELL WITHERSPOON, M D

LABOR AND ITS COMPLICATIONS

Cochran, G. G., Jr. The Pomeroy Maneuver (Rotary Version) An Evaluation of Results in 200 Cases *Brooklyn Hospital Journal*, 1940, 2 155

The Pomeroy maneuver is a rotary version devised to eliminate the uterine inertia and cervical dystocia that occasionally occur in primiparous labors with the fetus in the posterior position The procedure is performed as soon as the cervix is dilated sufficiently to admit the operator's hand Both the body and head of the fetus are rotated 180 degrees An analysis of 200 cases shows the advantages of this operation to be

- 1 The first and second stages of labor are shortened

- 2 The difficulties of midhigh and high forceps extraction are minimized because the vertex has been placed in the favorable anterior position

The danger of the Pomeroy rotary version appears to lie, not in puerperal infection, hemorrhage, or rupture of the uterus, but in the use of general anesthesia Three of the 4 maternal deaths in this series were incident to the use of general anesthesia for the rotation, and were attributed to aspiration pneumonia Within the past four or five years spinal anesthesia has been employed almost exclusively with a view to eliminate this hazard

J THORNWELL WITHERSPOON, M D

MISCELLANEOUS

Fairfield, L. Mothers under Sixteen *Lancet*, 1940, 239 62

In a series of 133,361 deliveries made in a group of 23 municipal maternity units and 1 voluntary hospital during the period from 1931 to 1938 there were 74 mothers under the age of sixteen at the date of confinement

Among these 74 mothers the maternity mortality was nil, and there were 2 still births and 3 neonatal deaths All the mothers made a good recovery

J THORNWELL WITHERSPOON, M D

THE EVALUATION OF RETROGRADE AND INTRAVENOUS PYELOGRAPHY

Collective Review

WILLIAM J. BAKER, M.D. F.A.C.S. Chicago, Illinois

A DECADE has passed since Von Lichtenberg, Binn, Swick, and other coworkers announced the use of uroselectan to visualize the urinary tract. To prove the claims for the intravenous method of urography these workers visited England, the United States, and other countries to present their work. In the meantime improved, less irritating chemicals for secretory urography and critical analyses of experiences with urography have appeared.

CLAIMS AND DISCREPANCIES

Early workers emphasized that intravenous visualization of the urinary tract would show the true anatomy of the tract because the physiology of the kidneys, ureters, and bladder would not be disturbed. As recently as 1938, Lower and Nichols state, "It is now possible for the first time to analyze the function of the urinary system as well as to determine its anatomical variations both in health and disease. Many observers have studied the kidneys, ureters and bladder by this method, using it merely as an adjunct to pyelography by the instrumental method and have attempted to compare the value of the two methods. No such comparison is possible, as retrograde pyelography is purely a mechanical filling of the tract with an opaque medium entirely irrespective of any functional activity of the organs under consideration, the consequent filling indicating merely the anatomical condition of the lumen of these organs. On the other hand, Keyes and Ferguson state, "As a measure of renal function secretory urography is peculiarly inaccurate. Like indigo carmine, when it is bad, it is boring. A normal kidney is usually so saturated by the excreted solution that the outline of the parenchyma is plainly seen, its efficiency disclosed, but occasionally a perfectly normal kidney for no known reason fails to secrete the solution. Hence we may depend upon adequate renal secretion of uroselectan as evidence of good function while we must simply disregard inadequate excretion whether unilateral or bilateral."

Associate Urologist of St. Luke's and Cook County Hospitals, Chicago, Illinois.

These discrepancies in the physiology and anatomy of the urinary tract as portrayed by urography can be accounted for. First, pictures are taken sometimes when a part of the urinary tract is in systole and at other times when it is in diastole. Not long after the procedure of secretory urography had been initiated, the fluoroscopists and pyeloscopists (Jarre, Cumming, Moore) drew attention to the normal peristaltic spasms and contractions of various parts of the urinary tract, these evidences of muscular stimulation or activity produced urograms with bizarre forms and filling defects of the calyces, pelves, and ureters which were most confusing. These phenomena occur much less often in retrograde ureteropyelograms. Second, discrepancies are sometimes due to the fact that one or the other side of the urinary tract may be reflexly inhibited so that no secretion takes place and therefore a nephrogram is not obtained. This inhibition of renal function may be due to urinary extra-urinary ipsilateral, or contralateral causes. Bilateral failure of intravenous urography may be due to narcotics, chronic cardiovascular renal disease, or back pressure due to obstruction in the lower urinary tract. Third, some kidneys secrete the chemical so fast that it is impossible to obtain urograms. This fact has often led to the erroneous diagnosis of a functionless kidney. One cannot emphasize too often that unsatisfactory urograms are always an indication to obtain more programs; this applies to both secretory and retrograde visualization. An interpretation of a non-visualizing kidney should be made with a consideration of a two-hour total phenolsulfonphthalein and a blood protein-nitrogen determination. Fourth, errors in roentgenological technique may produce misleading urograms; meticulous care must be exercised in the preparation of patients to eliminate gas and extraneous shadows. Wesson believes that the intravenous media inhibits peristalsis and increases the gaseous content of the bowel. Fifth, misinterpretation of urograms by roentgenologists helps to confuse the clinician and surgeon when deviations from normal anatomical outlines and physiology occur. There is no doubt

that the roentgenologist who has had the privilege of reading many intravenous urograms can interpret more correctly the even less detailed pictures of secretory urography

The peculiar inaccuracies of intravenous urography hinder standardized interpretation. One must learn to consider the clinical picture and laboratory findings along with the roentgenological evidence. It seems that the primary premise of adequate intravenous urography is the presence of normal secretory tissue; it follows, then, that nephrograms are most needed in the patient who lacks, in some degree, normal secretory tissue of the kidney. Von Lichtenberg states that one is able to interpret the dynamics of the urinary tract by observing the expulsion of uroselectan. He follows this statement, however, by a warning that good films may be expected only when the kidney function is satisfactory. It is true that the procedure has taught us a great deal about the physiology of the urinary tract, but too often it has failed to demonstrate the true configuration or anatomy of the urinary tract, the normal contractions and relaxations of the urinary tract have produced filling defects of the calyces, pelves, and ureters which are often most confusing. Often, only fragmentary pictures of the renal pelvis and ureter are obtained by this procedure. On the other hand, Scott, in his work, showed that retrograde pyelography, even under reasonable increased pressures, did not distort the anatomy or configuration of the urinary tract. It cannot be denied that more detail and better outlines are obtained in the retrograde urograms when renal pathology is present.

UROGRAPHY AS A TEST OF RENAL FUNCTION

Several reports have recommended intravenous urography as a splendid measure of renal function from two points of view. First, since the glomeruli handle most of the iodide, a shadowgraph of the secreting portion of the renal parenchyma is produced. Under ordinary conditions this is true. If both kidneys are clearly visualized within a normal time after injection, their functional condition is usually normal. Second, the secreted iodide could be recovered in the urine and compared against normal standards (Carhart), however, this process is tedious and expensive and has been discarded as impractical. According to Vorobtzov, the simple intravenous indigo carmine renal-function test has proven more accurate than the measurement of iodide in the urine, autopsy material on which both tests have been made has proved the superiority of the indigo-carmin test for true renal function. On the other hand,

Braasch and Emmett made a study of excretory urograms in an effort to determine their value as a test of renal function, using the intensity of visualization of the media in the urogram, together with its time of appearance, as a basis for comparison. They found in 39, or 78 per cent, of 50 cases of various diseases of the urinary tract in which both excretory urography and differential tests with indigo carmine were used, that the two tests were in close agreement. In 11, or 22 per cent of the cases, the two tests did not agree. These authors also found that in hydronephrosis, pyelonephritis, polycystic disease, and solitary cyst of the kidney the urograms seemed to indicate the renal function quite accurately, and stressed, as so many workers do, that these estimations of function depend upon the experience of the men who interpret the urograms. Braasch and Emmett believe that in renal tuberculosis, calculous disease, and renal tumors the intensity of visualization in the urogram in relation to renal function is often inaccurate, but that the additional helpful information which the nephrograms furnish, more than outweighs this discrepancy. Biancardi found that when renal tissue is seriously diseased intravenous pyelography and the indigo-carmin test give practically identical results as to renal function, when, on the contrary, the parenchyma is not diffusely involved, pyelography may show normal findings while the elimination of indigo carmine is decreased or absent. Hence, the latter test is much more sensitive. Campbell makes the following statement, "Although radiographic evidence of the quantitative and qualitative excretion of the medium is a moderately reliable comparative test of the function of the two kidneys, it should not replace the phenolsulphonaphthalein or indigo carmine excretion estimations."

INDICATIONS FOR SECRETORY UROGRAPHY

In earlier communications most writers enumerated very definite indications for secretory urography. At the present writing it seems that intravenous urography is indicated whenever visualization of the urinary tract is desired. This point of view has led to a wide use of the procedure by all types of clinicians to direct attention to or exclude urinary-tract pathology. As a corollary, the free use of the procedure has uncovered a great deal of previously undiagnosed uropathy. This idea of general usage is justified if physicians will bring their troublesome urograms to those who have had sufficient experience in the interpretation of secretory urograms. There is no danger in the general use of the

method if the pitfalls of the method are kept in mind. In a great many medical centers, secretory urography is used in patients who are suspected of having urinary tract disease and if the suspicion is verified, retrograde urography is used to obtain further and more detailed urograms. For instance Carhart says, "Intravenous urography should be used routinely in suspected genito-urinary disease much the same as gastro-intestinal pathology. This plan sounds logical, if one does not have to consider the double expense of two procedures to the patient. However if one is fairly certain that the patient can bear the expense of only one procedure if one would like to know the source of pus and blood in the urine and the character of the bladder and its outlet, or to make careful differential renal-function tests with dyes and culture the segregated kidney, then the retrograde method of study of the urinary tract is to be preferred. This is true especially if the urologist is an experienced cystoscopist and will use adequate local, caudal or spinal anesthesia. Since the retrograde use of the less irritating intravenous iodides for pyelograms has become prevalent, postcystoscopic irritation is slight and instrumental reactions are rare. Mark and Johnson state, "Iopax in 30 per cent solution causes approximately the same degree of hemolysis as 15.5 per cent sodium iodide, though its use is unaccompanied by any mucosal or submucosal change, and no evidence of irritation is found." Also, bilateral retrograde pyelograms can be made with no fear of anurias from such substances as hippuran and neopax. Thus, a few of the time honored objections to retrograde urography are met. The argument has been used that secretory urography is less costly to the patient however in most institutions and laboratories, the charges are greater for intravenous than for retrograde urograms. Secretory visualization of the urinary tract consumes less of the patient's time than retrograde urography. Many times rographic study of the ambulatory individual by intravenous methods spares hospital expense. Braasch has a very sane point of view when he states,

"Although excretory and retrograde urography have individual advantages, they frequently are of complementary value and may be combined to good effect. Excretory urography will be used more generally in differential abdominal diagnosis and preliminary to subsequent rological investigation, if necessary. Retrograde rography will be used more frequently in gaining detailed information regarding pelvic and ureteral deformity which the other method often fails to give. As a routine it usually is best to make an

excretory urogram first, and if visualization is unsatisfactory a retrograde urogram can be made."

Secretory urography is the only means of studying the urinary tract after the ureters have been transplanted to the bowel. oftentimes intravenous urography provides the only means of determining the state of the kidneys and ureters in the presence of carcinoma of the bladder. Intravenous visualization of the urinary tract is invaluable in determining the condition of the kidneys and ureters. In bladder-neck obstruction an exception to this occurs in the patient who has kidney and ureteral pain from vesico-ureteral reflux back of an unsuspected bladder-neck obstruction retrograde study is then indicated. Most of the patients with prostatic conditions are old and do not stand ureteral catheterization and retrograde pyelography well but it should be emphasized that secretory visualization of the bladder is much less reliable than a good look at the bladder and its outlet through a cystoscope for determination of the bladder pathology and a decision as to the method of management. Secretory urography has been used by Loman, Greenberg, and Myerson to study the effect on the urinary tract of the administration of certain drugs namely mecholyl, prostigmine, benzedrine sulfate and atropine. The method is valuable in research work both on human beings and animals.

Bogbee and Murphy state "While a remarkable addition has been made to the field of urology through the painstaking work of the pioneers in the technique of secretory urography it is primarily a method of corroboration, to be employed as a supplement to our present methods of urological diagnosis—except in the very limited number of cases in which cystoscopic manipulation is impossible. Here it gives much valuable data otherwise unavailable but when such data are unsupported by cystoscopic information, the interpretations must be made with extreme care and conservatism."

VISUALIZATION OF RENAL TUMORS

From the beginning, it was recognized that intravenous urograms did not give sufficient detail in the study of renal tumors, early tuberculosis, and cyst infections. Lucini, in 1931, stated that he believed more precise and better roentgenograms were obtainable in renal tumors from retrograde pyelography than from intravenous urography, even though the most rigid technique be followed in the latter. Braasch, in 1931 says, "It is only in exceptional cases that deformity typical of neoplasms will be visualized

clearly It is manifestly impossible to employ intravenous urography in the differentiation of the various types of neoplasm or in the differentiation of polycystic kidney, simple cyst, and other lesions suggesting renal tumors" Herbst, in 1931, states, "In a case of polycystic kidney, as well as cases of tumor of the kidneys, the filling of the deformed pelvis was insufficient to enable us to make a diagnosis, while the cystoscopic pyelogram gave quite a typical conformation" However, Braasch, in 1936, states, "A recent review of the urographic evidence available in a series of cases of neoplasm disclosed that the excretory urogram sufficed to make the diagnosis in 80 per cent However, when the details of the minor calyces are not clearly visualized, a retrograde urogram always should be made if the possibility of neoplasm is considered"

Mintz, in discussing roentgen diagnosis in 94 cases of renal tumor, states, "Intravenous urography has increased our knowledge greatly regarding the renal contour, it is without question the best means to visualize the renal silhouette We have begun to learn a great deal about the normal variations and in a very few instances have been able to diagnose those relatively small tumors that bulge the renal contour without producing any marked change on the excretory system While intravenous pyelography has been of great assistance in the visualization of the kidney proper, from the experience gained from this series, it cannot be said that it has supplanted retrograde pyelography The deformities of the pelvis and calyces are not as a rule as clearly shown by the former method as by the latter In only a few cases was operation performed on the information obtained by intravenous pyelography alone"

Stang is of the following opinion, "Renal tuberculosis and tumors in their early stages can be located by intravenous urography in very few instances, and these conditions are most important for early diagnosis as far as the patient is concerned"

Gayet thinks that retrograde pyelography has marked advantages over intravenous urography in the study of renal cancer because retrograde pyelography is an essentially anatomical method which maps out the cavities of the urinary tree and is capable of showing the slightest changes set up by cancer

Ochsner, Wishard, and Mertz state, "There is an occasional brilliant success with intravenous urography in cases of tuberculosis and in tumors of the kidney, but in the majority of cases insufficient information is obtained for accurate diagnosis"

Stevens states, "Better visualization of the renal cortex following excretory urography is an important factor in the diagnosis of those tumors of the kidney that do not involve or exert pressure on the renal pelves or calyces"

SECRETORY UROGRAPHY FOR RENAL TUBERCULOSIS

There is an apparent attempt to place greater and greater value on intravenous urography for the diagnosis of renal tuberculosis Campbell, in discussing intravenous urography for children said, "In renal tuberculosis the function of the good kidney and its freedom from tuberculosis infection can scarcely be determined except by the ureteral catheter and even then confusion may arise" Braasch, in 1931, wrote, "The data offered by intravenous urography are seldom sufficient to identify renal tuberculosis Even though there may be normal visualization of the supposedly healthy kidney, it is necessary to catheterize it in order to exclude tuberculous infection" On the other hand, Braasch and Emmett, in 1938, wrote, "An analysis of the methods of diagnosis employed in 100 consecutive cases of proved renal tuberculosis suggested that in more than two-thirds of the cases the problem involved is not one of establishing the presence of the disease, but rather one of determining the degree of involvement of each kidney Excretory urography is becoming more important in this field of diagnosis and is supplanting retrograde pyelography in a very large percentage of cases However, retrograde pyelography is still of importance in differential diagnosis in a small group of cases in which the disease itself is in doubt or in an occasional case in which the lesion is exceedingly small and circumscribed Although nephrectomy is being advised in some cases, on the basis of data furnished by excretory urography alone, this is still a rather questionable practice A combination of excretory urography plus microscopic examination and staining the specimen of urine obtained by catheterization of the ureter of the so-called good kidney is no doubt the best procedure to follow at present and supplies sufficiently accurate information in most cases to establish a satisfactory diagnosis and to permit the urologist to decide on the proper plan of treatment" This last statement coincides entirely with the views of most urologists

Inasmuch as renal tuberculosis is only an expression of a systemic disease and inasmuch as iodides activate pulmonary tuberculous lesions, one wonders about the effect of large intravenous doses of hypertonic iodide solutions to obtain

urograms. The literature is full of warnings about intravenous urography in patients with pulmonary tuberculosis but contains no specific reports of bad results. However, in a personal communication from Dr. D. F. Rudnick, it is learned that he is preparing a paper in which he is reporting several instances of the production of milary tuberculosis by the use of intravenous urography.

UROGRAPHY AND INFECTIONS OF THE URINARY TRACT

The statement that intravenous urography has no value in the study of acute urinary tract infections, because the urograms usually furnish no information, appears in the literature many times. Most urologists do not worry about nephrograms in acute urinary-tract infections; conservative palliative treatment is instituted and urography is usually postponed. However, those clinicians who choose to use intravenous urography in acute infections of the urinary tract probably do no harm and might disclose some obstructive cause of the infection. On the other hand, many acute renal infections have been flamed into serious systemic bacteremias by unnecessary early retrograde urological study.

The pronounced changes which chronic urinary tract infection may cause in the kidneys and ureters are usually shown by excretory urography. However, as Brunsch says, "The minor deformities in the renal pelvis and calyces, which usually result from chronic renal infection, are often incompletely visualized in the excretory urogram and can then be shown only in the retrograde urogram." It can be said also that retrograde study will obtain segregated urines for culture and other studies, which are important for intelligent therapy, and all urologists have seen definite good come from the passage of ureteral catheters alone in urinary tract infection, probably because of the promotion of better urinary drainage.

Wesson states, "The pictures made by the intravenous method are generally less clear and do not always delineate the minor degrees of deformities in the calyces because there is a five per cent concentration as against 12 per cent to 5 per cent (and up to 20 per cent with the newer media) in the retrograde method. *Paradoxical secretion holds back the drug.* The opacity of the kidney substance is dependent on the kidney threshold. Poor function results in poor pictures as the elimination of a contrast substance is an index of the kidney activity. If functionally efficient renal parenchyma is no longer present then the method is practically worthless. The ideal method is to do intravenous first, then follow if any abnor-

malty is detected, with retrograde pyelography to confirm the findings.

VISUALIZATION OF DILATATION OF THE UPPER URINARY TRACT

Excretory urography excels in depicting moderate and advanced caliectasia, pyelectasia, and ureterectasia; however, it is sometimes necessary to wait a long time for the excretion of the iodide by a damaged kidney. For early and slight dilatation of the ureters, pelvis, and calyces, the retrograde method of study is superior to the excretory method. This is because of the fact that the kidney and ureter are normally in diastole and do not undergo passive distention to any degree. According to Douglas, retrograde injection does not distort the anatomy of the ureter and renal pelvis. Cumming stressed the weakness of intravenous technique in its lack of aid in determining the so-called emptying time of a renal pelvis and ureter. These minor degrees of stasis in the urinary tract are best studied by the retrograde method, always with the use of the delayed film to prove the poor and delayed emptying ability of the pelvis. Hinman says, "Many pelvises appearing normal in excretory films have been shown by subsequent retrograde pyelography to be hydronephrotic. Ureterectasia of considerable degree is easily overlooked unless there is actual obstruction or retention of the urine in the ureter at the time of roentgenographic exposure."

GYNECOLOGY AND UROGRAPHY

Kultray says, "The objection to intravenous pyelography as far as the gynecologist is concerned is the usually exact visualization of the upper lumbar segment of the ureters and the indistinct visualization of the segments situated in the lesser pelvis, the part of the urinary system which is of the greatest significance to the gynecologist. The retrograde uretero-pyelography represents a method which permits a thorough visualization of all the segments of the urinary apparatus. In spite of this objection, secretory visualization has aided the gynecologist to prove the integrity of the ureters after pelvic operations. It might also be added that the character of the bladder interior and cultural studies of the segregated urines may throw a great deal of light on a gynecological problem."

INTRAVENOUS UROGRAPHY AND PREGNANCY

Secretory urography has been used extensively to portray the changes of the upper urinary tract during pregnancy. Crabtree has summarized the

use of the procedure well when he says, "The kidney in pregnancy behaves unlike the normal non-pregnant woman's kidney in several important respects when studied by means of intravenous pyelography. In the non-pregnant woman with normal kidneys the best excretion of the dye is commonly seen in from five to fifteen minutes after injection. In pregnant women, except in the first or second months of pregnancy, the best excretion is at 30 minutes, even though the degree of dilatation of the pelvis and ureters is not great. In this behavior in early pregnancy is seen the hormonal action alone before pressure from the gravid uterus is of effect. Rossi noted in non-pregnant rabbits that after injection of the alcohol concentrate from the blood serum of pregnant rabbits or when the rabbits were pregnant in the twenty-first to twenty-fifth day of gestation, that the best intravenous pyelograms were obtained in from the fifteenth to twentieth minute after injection of the dye in contrast to the third and fourth minute when non-pregnant or before injection with the alcohol concentrate. If the dilatations are extreme the best filling may not appear for an hour. It may be inadequate to demonstrate the kidney and ureter at all in some extreme degrees of hydronephrosis and hydroureter. Where the dilatation is large, evidences of the dye in good concentration is noted in the calyces, but distribution of it through the contents of the atonic, inactive pelvis and ureter is too slow to produce sufficient density of the media to cast a shadow. In the average case at any time past the second month of pregnancy the intravenous method of pyelography is well adapted to produce entirely satisfactory shadows of the pelvis and calyces and the upper two thirds of the ureter. The lower third of the ureter is seldom shown except when a pathological condition is present."

Woodruff and Milbert, in discussing secretory urography during pregnancy, state, "The pregnant woman was found to tolerate the injection well, and no apparent ill effect was noted on the fetus in utero or newborn, either from the drug or from the exposure to roentgen rays. An interesting problem arises in connection with the use of a complex halogen and the roentgen ray during pregnancy. Does diodrast or a similar preparation reach the fetus through the placental circulation? Is there any danger of iodism in the fetus if such transmission does occur? May it be possible by refined radiographic technic to show the presence of dye in the urinary tract of the fetus during the final months of pregnancy? It is known that the fetal kidneys function during the last few months of pregnancy."

Miller, Corscaden, and Harrar, after reviewing the literature on the effects of radiation on the human offspring, conclude, "It seems reasonable to advise that the use of x-ray during pregnancy for treatment purposes be restricted to very clear and urgent indications, and that the use of diagnostic x-ray examinations be not too frequently repeated during pregnancy." This problem of multiple exposures to the x-rays by urography during pregnancy should be borne in mind.

SECRETORY UROGRAPHY AND RENAL CALCULI

Secretory urography is very satisfactory in the study of renal calculi and their damage to the kidneys. It does not, however, furnish bacteriological or hydrogen-ion-concentration information of the segregated urines. Ribbing has drawn attention to stratification of the opaque medium in secretory urography. "This may stratify under the urine in the pelvis, though less common and possibly less apparent than in retrograde urography. By reason of the ureter being in front of the psoas the opaque medium flows down and fills it, while the urine which holds no medium rises to the pelvis." This fact may cause confusion in the study of renal calculi. Boeminghaus, in discussing the function of the kidney in acute complete occlusion of the ureter by calculi, says, "If the shadow of the kidney, renal pelvis and ureter appear distinctly soon after the intravenous injection of the contrast medium, the occlusion is of short standing. If the renal parenchyma alone is impregnated for some time, without the renal pelvis and ureter up to the site of occlusion being visible, the occlusion has, with all probability, lasted for several hours. The paler the shadow of the kidney, the later the passage of the contrast medium into the renal pelvis, the longer the occlusion has lasted. The occlusion may be assumed to have lasted several days if neither the kidney nor the renal pelvis appears on the roentgen plate."

Marion uses urography to indicate which patients with ureteral calculi should have inlying ureteral catheters. He states that urography will show whether there is dilatation of the canal above the stone, if small or there is none at all, the inlying catheter is indicated, if there is much dilatation, catheterization is not only useless but dangerous, useless, because the markedly dilated ureter has lost its contractility and will not expel the stone, dangerous, because in spite of all precautions microbes are introduced, which, reaching a point of stasis, infect the content and complicate the case.

Wulff states, "Of 40 cases in which urography was performed during an attack of pain 36

showed positive findings, while of 45 cases urographed in painlessness during the first two days following an attack of pain 23 gave positive and 22 negative findings, hence, if an acute abdominal condition represents an attack of nephrolithiasis it can with the greatest degree of probability be verified by urography during an actual attack of pain—a fact which is of great importance in clinical diagnosis. However acute blockage of the ureter causes non-visualization of the related kidney many times.

Dourmashkin concluded, In the presence of apparently complete calculous obstruction of the ureter intravenous pyelography frequently supplies the only medium for ascertaining renal function on the affected side. In the greatest majority of chronic ureteral stone cases intravenous pyelography demonstrated perfect renal drainage. In many cases little difference was noted in the outlines of ureteropelvic tracts on both sides. The presence of impassable obstruction is not a criterion which determines complete impaction as in many such cases perfect drainage was revealed by intravenous urography. The temporary nature of absent ureteropelvic shadows, following the injection of the dye in cases of acute block and those of chronic renal hibernation should be constantly borne in mind, lest it should be confused for instances of permanent renal destruction in which cases the dye may be similarly not excreted. Intravenous pyelography is of no value in localizing uric acid calculi.

Teall says, Intravenous urography is extremely useful in children for the purpose of localizing doubtful shadows in the region of the kidneys and ureters. Owing to the fact that the pelvic shadow is not so dense as that obtained with retrograde pyelography the outline of a stone may be seen through the shadow of the uroselectan, thus rendering its localization more easy.

Moore reported on 5 patients who had one or more stones in the ureter with temporary absence of function, as shown by secretory urography. In whom a return to normal was proved following removal of the calculi.

UROGRAPHY IN CHILDREN

Hinman has written, Excretory urography has been heralded as revolutionary in urological diagnosis by doing away with the need of disagreeable and painful instrumental studies. As a matter of experience, excretory urography has a limited field of usefulness in urological diagnosis as compared to the more complete and definite findings of ureteral catheterization. Occasionally it may give valuable information, and it is particularly

useful in patients who cannot be catheterized, and in children. On the other hand, with reference to the use of excretory urography in children, Campbell writes, "Increased diagnostic accuracy in congenital or acquired uropathy in infants and children was one of the anticipated advantages of intravenous urography when first introduced. Subsequent experience has demonstrated that the method (a) is often inadequate even in normal cases and (b) is not always a reliable basis for resort in urologic diagnosis in those cases in which complete instrumental investigation is undesirable or prohibited by lack of parental consent or inability of the investigator. Although the data acquired in this comparative study of 304 cases warrant only general conclusions, they suggest that even under favorable conditions intravenous urography in children will be unsatisfactory in about a third of the cases and under unfavorable conditions is practically valueless. In general, the patience of the roentgenographer and the accuracy of his technique are the most important factors in determining the success of excretory urography. Unsatisfactory results are favored by faulty roentgen technique, poor renal function, polyuria and confusing gas or fecal shadows. Nephrectomy in juveniles is seldom justified on excretory urographic findings alone.

It is a well known fact that children withstand instrumental investigation better than adults; reactions are fewer and less severe. Improvement in urological instruments for children has increased retrograde urological study in the very young patients. Several authors have suggested that if it is necessary to put children asleep to do intravenous urography retrograde urography should be done and better results can be expected.

Schwenkler found that among 56 young patients examined by secretory urography at the Johns Hopkins Hospital satisfactory diagnostic help was obtained in 65 per cent of the 43 children more than two years of age and in 35 per cent of the remaining 14 less than two years.

Teall writes, Intravenous urography in children has not replaced the retrograde method, for the limitations of intravenous urography are the same in children as in adults. As in adults the two methods are complementary and not mutually exclusive. It is in the investigation of cases of chronic pyuria that intravenous urography has been found of particular value in children.

Swick, in reporting his experiences with intravenous urography in children, states that he employs the less taxing and simpler method of excretory urography first, both for diagnosis and

as a survey study, if corroborative evidence is necessary, or the results from urography are equivocal, retrograde pyelography is carried out

Campbell also states, "Secretory urography is poor for the very young because the normally small pelvis and ureter will contain only a thin thread of excreted media" Campbell quotes Wade as saying, "We now appreciate that excretory urography should not be depended upon as a routine means of demonstrating the cause of disease, its province is to demonstrate the effect"

Nevertheless intravenous urography has made possible the early discovery of many previously unsuspected anomalies of the urinary tract and has made retrograde urological study unnecessary in many of these cases Double kidneys, double ureters, branched ureters, ectopic ureteral openings, and fused kidneys have been added to the clinical lists by the dozens It should be noted that intravenous urography will often fail to demonstrate fully the bifid kidney and double ureter, whereas, a properly made ureterogram will do so Crenshaw estimated in 1935 that extravascular ureteral orifice had been diagnosed in approximately 1 of 130,000 cases at his clinic, the increased use of excretory urography had increased the number of anomalies that were found, and from 1935 to 1939 extravascular ureteral orifice was found in 1 of every 81,150 patients Intravenous urography is still unreliable for the diagnosis of polycystic kidney, the retrograde urogram gives more reliable anatomical detail because the poor secretory tissue of the polycystic kidney produces poor urograms

THE SOLITARY KIDNEY AND UROGRAPHY

The diagnosis of solitary kidney by means of intravenous urography is not reliable, such a diagnosis should always be verified by retrograde urological study The presence of a solitary kidney should always be kept in mind when one kidney and ureter fail to be visualized In a recent experience, intravenous urography revealed what was believed to be a low ureteral stone with non-visualization of the related kidney, surgery was done on the basis of the nephrograms and clinical picture, only to reveal that the stone was a phlebolith, later retrograde urological study proved the presence of a solitary kidney on the opposite side

VISUALIZATION OF THE INJURED URINARY TRACT

Secretory urography has been repeatedly recommended for visualization of trauma to the kidneys, ureters, and bladder Narath has reported an extrarenal extravasation observed in

the course of intravenous urography and cited similar cases reported by Hendrick and Heckmann Although these reports probably represent abnormal lymphatic phenomena or pyelovenous backflow, the resulting urograms could be mistaken for the urogram of injured kidneys (Jarre)

Pizzagalli reported the use of secretory urography in 5 serious injuries of the kidneys and concluded that one can, in a general way, decide in favor of a partial renal lesion, also the state of the renal pedicle can be judged to some extent, but in order to avoid error due to reflex anuria or spasm, it is better to delay pyelography until diuresis is reestablished and hematuria reduced

DiMaio used secretory urography in 4 patients with renal contusions and found the procedure of great value in doubtful cases He states, "A ruptured pedicle does not show any shadow When the ureter is torn, the image is that of diffusion into the renal fossa, or none at all, from functional inhibition It is especially important in estimating the amount of damage, when the shadow is normal the prognosis is good, but if none is seen there may be a rupture of the pedicle or extrinsic compression by a hematoma. Changes in the shadow of the pelvis or calyces define the type of renal lesion" He believes secretory urography should not delay preparations when an operation is clearly indicated (large hematoma, with fall of blood pressure, syncope), and that, like retrograde pyelography, it is of postoperative interest Crane and Schenck found cystography preceding cystoscopy to be their most reliable procedure in suspected cases of bladder rupture Culver and Baker depended most on the history, physical findings, and observation cystoscopy in the diagnosis of rupture of the bladder McKenna advises the routine use of intravenous urography in suspected injuries to the genito-urinary tract Ewell believes that excretion urography is of distinct advantage in the diagnosis of traumatic injuries of the urinary tract

If one insists on visualizing injuries of the urinary tract, intravenous urography may be used and will occasionally show interesting abnormal anatomy with little or no danger to the patient, whereas retrograde urological study of these patients, except for suspected rupture of the bladder, is usually contraindicated for well known reasons Secretion urography will usually demonstrate a diffusion of the secreted media into the tissues in the neighborhood of the injury

CONTRAINDICATIONS OF RETROGRADE UROGRAPHY

There are contraindications to the use of both of these methods of visualizing the urinary tract

The absolute contraindications to retrograde urography are (a) inability to pass an examining instrument, (b) inability to catheterize the ureters, (c) debilitated patients who would be unable to undergo instrumentation, (d) acute infections of the urinary tract, and (e) inexperience in cystoscopic work. Relative contraindications are listed as (a) patients from whom little or no helpful information could be obtained by retrograde study and from whom secretory urography would elicit enough information and (b) refusal of instrumentation. With the proper use of local, regional, intravenous, or even an occasional general anesthesia and non-irritating pyelographic media, fear of instrumentation is no longer a contraindication to retrograde urological study.

CONTRAINDICATIONS OF SECRETORY UROGRAPHY

The contraindications to the use of secretory urography have been listed by numerous workers as (a) marked renal insufficiency (uremia or impending uremia) (b) cardiovascular diseases such as coronary disease, advanced myocarditis, and decompensated cardiac conditions, (c) impaired hepatic function, (d) active pulmonary tuberculosis (already discussed) (e) hyperthyroidism, (f) iodine idiosyncrasy (g) excretive diatheses, and (h) hyperpyrexia.

DANGERS OF RETROGRADE UROGRAPHY

Both methods of investigation harbor dangers, actual and potential. The possibility of instrumental reactions is always present when retrograde examinations are done. Wehrhelt has pointed out that these reactions occur in spite of meticulous technique and instrumentation. Ureters have been ruptured and many false passages have been made by inexperienced and experienced cystoscopists. Bladders have been punctured, extraperitoneally and intraperitoneally by cystoscopes. Baretz has reported the rupture of 3 kidneys by retrograde pyelography. Many obviously remain unreported. Stevens, in writing about injuries associated with retrograde pyelography says, "Secretory urography furnishes sufficient data for accurate diagnosis in a limited number of cases; in the others it must be supplemented by retrograde infection. It is impossible to perforate a normal renal pelvis with an ordinary ureteral catheter. Extreme gentleness should be employed in the catheterization and injection of the renal pelvis in infants and young children. Injury to the kidney and backflow are not uncommon during retrograde pyelography. The principal danger accompanying extrusion into the parenchyma of the kidney and in various

types of backflow lies in the dissemination of infectious material. Extravasation into the renal parenchyma may be responsible for mistakes in diagnosis. Rupture extending through the capsule of the kidney is the most dangerous complication associated with retrograde urography. On the other hand, Strnad described 4 instances of perforation of the pelvis during ureteral catheterization of cadavers. The perforation was practically always in the upper calyx, ordinarily the catheter curled up and did no damage. He concluded the accident is exceptional. Fatal anurias were not uncommon when irritative pyelographic media were used, especially when bilateral pyelography was attempted. Shapiro and Veen reported 5 deaths directly attributable to bilateral retrograde pyelography. The literature contains no such reports since the advent of such substances as neolopax and hippuran for retrograde ureteropyelograms. Then there is the potential danger of introducing infection into the urinary tract by instruments. Many urologists believe that the bacillus proteus is always carried into the urinary tract via some sort of instrumentation. Careful pre-operative and postoperative oral and intravenous medication will probably reduce instrumentation reactions and infections.

DANGERS OF INTRAVENOUS UROGRAPHY

The use of intravenous urography is not all "moonlight and roses." In addition to the minor reactions of warmth, dryness of the throat and mouth, flushing, uneasiness, choking, palpitation, syncope, nausea, vomiting, tachycardia, pain at the site of injection extending up to the shoulder, acute pain in the kidneys radiating down to the bladder, erythema, urticaria, swelling of the lips, tongue and eyes, sneezing and lacrimation, and temporary anuria, several sudden deaths have occurred during or following the use of hypertonic iodides for intravenous urography. Crane, Cumming and Chittenden Tachot, and Dolan have all reported such deaths. Cumming and Chittenden listed deaths reported to them by Ravich, McDevitt, Moore, Kearns, and Belt. A few of these patients could be listed in the poorly selected group for secretory urography. Dolan suggests that all patients who are to be subjected to secretory urography should hold a few cubic centimeters of the media on the tongue and in the mouth a few minutes to exclude idiosyncrasy for iodides. Painful infiltrations and thrombooses have occurred at the point of injection of the hypertonics. Venous puncture has been most difficult in people who have poorly developed veins, in obese patients, and in children.

Investigations of Dietrich (cited by Butzengeiger) have demonstrated clearly that the intravenous injection of hypertonic solutions may easily produce endothelial transformations. This may result in a tendency toward the formation of thromboses at any later time. It is suggested that the increased incidence of embolism and thrombosis might well be due to the increased use of intravenous hypertonic solutions.

SUMMARY

1 Intravenous urography is of greater value than retrograde urography in directing attention to uropathy, because it is easier to administer and requires less time of the patient and doctor.

2 Many secretory urograms of uropathy must be confirmed by retrograde pictures. Therefore, it is the prevalent practice to do intravenous urography first, and confirm unsatisfactory, suspicious, or equivocal urograms with the retrograde method.

3 Lack of detail and peculiar inaccuracies prevent a standardized interpretation of intravenous urograms.

4 Retrograde urography plus the kidney function tests by means of the intravenous injection of dye give a more accurate picture of renal function than secretory urography, and are therefore much more reliable than secretory urography in the study of the so called "functionless" kidney.

5 Retrograde urological study is indispensable when the condition of the bladder is to be determined or culture of segregated kidney urines is to be done.

6 Intravenous urograms do not give sufficient detail in the study of renal tumors and early tuberculosis. In the case of renal tuberculosis, it is necessary to catheterize and examine the urine from the supposedly healthy kidney, in order to exclude tuberculosis.

7 The retrograde method of urological study is superior to the excretory method in early and slight dilatation of the ureters, pelvis, and calyces. The retrograde pyelogram is the best means by which one can determine the emptying time of the renal pelvis.

8 Intravenous urography is a safe procedure for the pregnant woman, but visualization is much slower than normal and fails to show the lower thirds of the ureters after the second month.

9 Intravenous urography is satisfactory for the study of urinary calculi if the pitfall of occasional non-visualization due to acute blockage of the ureter is kept in mind.

10 Although secretory urography has been used a great deal in children, the procedure is only

about 50 per cent efficient in large series of pediatric uropathies, because of peculiar inaccuracies and the fact that a small pelvis and ureter will contain only a thin thread of the excreted media.

11 Intravenous urography may direct attention to the presence of a single solitary kidney, but such an entity should be proved by retrograde urological study.

12 Excretion urography is valuable in the diagnosis of suspected injury of the urinary tract.

13 Surgical procedures on the urinary tract are performed with fewer errors when cystoscopic observation of the bladder, retrograde ureteropyelograms, renal function tests with dye, and cultural studies of the segregated kidney urines have been done.

14 There are dangers in the use of both methods of visualizing the urinary tract, especially if the patients are poorly selected for either procedure.

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GENITO-URINARY SURGERY

ADRENAL, KIDNEY AND URETER

Lewis, T. J. Del Castillo, E. B., Soto, M., and Harp. E. Suprarenal insufficiency (*Insufficiencia suprarrenal*). *Rev. Soc. med. argent.* 94, 54 1957

LEWIS discusses the physiopathology of suprarenal insufficiency and concludes that complete explanation of the disorder cannot yet be given because up till now it has been impossible to determine which is the primary and basic alteration that is followed by the other changes. The disturbance in the distribution of water and electrolytes between cell and plasma is the cause of the crisis of insufficiency during which the animal is in condition of shock. However it should not be forgotten that the crisis is secondary to other disturbances, the nature of which is not yet well understood. The changes in the sugar metabolism are important but, as it is possible to cure them without reversing the fatal evolution of the disorder it is probable that they also are secondary to another and more general change. Undoubtedly the suprarenal glands fulfill other secondary functions in addition to their vital function this seems to be the nature of their relationship with the endocrine sexual function. The recent discovery of various substances of known chemical nature, which have been extracted from the suprarenal glands or from the organic fluids with different solvents, all clear up many problems in the near future. In the meantime great caution is indicated in drawing general conclusions.

DEL CASTILLO discusses the clinical aspect of suprarenal insufficiency. The diagnosis of the chronic form and, in particular of Addison syndrome when all the symptoms are present is easy. However, this occurs only in the terminal stage or in typical forms, while the typical or larval forms often cause great diagnostic difficulties. The acute form usually remains undiagnosed. The diagnosis of insufficiency must rest exclusively on complete history and clinical examination none of the laboratory signs are pathognomonic. Moreover some of them appear late when the clinical examination has already established the diagnosis. Harrop provocation test of natropenia may lend support to suspicion of the disease, as may also Kendall's potassium tolerance test the latter is somewhat more dangerous than the former and may cause fatal crisis even when fixacious suprarenal extracts are administered. Under conditions determined practically, but which are exceptional, the study of the chlorides and the sodium in the urine, according to the indications of C. L. F. Power and Wilder may give valuable information concerning the condition of the function of the suprarenal cortex. In some cases with slow evolution, roentgen examination of the suprarenal glands may reveal calcifications when present, this sign leads great light to the proba-

bility diagnosis. In general it may be stated that when a patient is suffering from acute or chronic suprarenal insufficiency it will be possible to make the correct diagnosis in most cases if he is thoroughly questioned and examined.

SOTO discusses the pharmacology and hence the treatment of suprarenal insufficiency. The treatment includes that of the cause which is nearly always tuberculosis, substitution therapy symptomatic treatment, and accessory measures dictated by the susceptibility of the patient to infection, drugs, heat, and effort. Substitution therapy consists of parenteral injections of extracts of suprarenal cortex from which the adrenalin and other inactive or toxic products have been eliminated. Oral administration may be used, but requires doses from 5 to 10 times higher and, therefore, becomes prohibitive on account of the cost. Besides, this route is inefficient in grave cases and in the treatment of crises. The parenteral doses used ranges from 5 to 10 c.c.m. daily up to 50 c.c.m. daily in cases of crisis. It is possible to make signs of insufficiency disappear with the use of extract only but it is advisable to combine its use with other treatments. Good temporary results have been obtained with homologous and heterologous grafts of suprarenal cortex the symptoms of insufficiency reappear after three or more months and the grafting process must then be repeated.

The administration of cystein (Rivofre) and of Vitamin C has been recommended in the treatment of mild cases and as an adjuvant to substitution therapy but its efficiency is not admitted by all authors. Desoxycorticosterone acetate is the parent and most active extract obtained at present time. It could seem that 5 mgm. of this product is the equivalent of from 1 to 5 c.c.m. of cortical extract. The indicated dose is from 5 to 10 mgm. daily in mild cases, 5 mgm. in grave cases and 50 mgm. in crises. From the practical point of view

5 mgm. of cortical extract can be replaced by 5 mgm. of desoxycorticosterone acetate. It presents the disadvantage of being insoluble in water therefore when rapid action is required as in crises, sterile extracts which can be given intravenously seem to be preferable. The results of repeated administration of the substance must be watched because it may cause the retention of sodium. A prolonged depot effect extending over about three months has been obtained by the subcutaneous implantation of 4 tablets of 50 mgm. each of desoxycorticosterone acetate.

The symptomatic treatment consists of the oral administration of sodium chloride, alkalies, glucose, and water the venous route should be used only in case of an emergency such as crisis or when the patient is vomiting, and should be abandoned as soon as feasible. The diet should contain less than

gm of potassium every twenty-four hours, should offer enough calories and vitamins, and should stimulate the appetite of the patient, the last is a capital requirement. Physical and mental effort, exposure to heat or cold, gastro intestinal disturbances, many drugs (insulin, thyroid extract, opiates, and strong purgatives), infections, small traumatism, and operations must be avoided. If an operation becomes necessary, even if it is only a dental extraction, the patient should be prepared for it one week beforehand by the daily administration of from 10 to 20 gm of sodium chloride, from 1 to 2 liters of water, and 10 c cm of cortical extract or its equivalent of desoxycorticosterone acetate. On the morning of the intervention, he should be given intravenously 2 liters of glucose, sodium chloride, sodium citrate solution, and 20 c cm of cortical extract, this treatment should be repeated after the operation.

RICHARD KEMEL, M D

Lukens, F D W, and Palmer, H D Adrenal Cortical Virilism *Endocrinology*, 1940, 26 941

The authors report the case of a girl with adrenal virilism in whom surgical exploration, when the symptoms were of five years' duration, revealed no tumor of the adrenal glands or ovaries. Six years later a roentgenogram, after air injection into the adrenal areas, disclosed a large tumor of the right adrenal. After the tumor was removed the patient exhibited striking symptomatic improvement.

Before removal of the tumor the patient's urinary androgen excretion was greatly elevated. After operation it became normal. Pre-operatively, the urinary estrogen excretion was increased, when assayed by the method of Frank, but it was normal when assayed by the method of Gallagher *et al*.

The results of these estrogen studies are of particular significance in view of the variations in estrogen excretion which have been observed in similar cases by others.

EDWARD W GIBBS, M D

Thorn, G W, and Firor, W M Desoxycorticosterone Acetate Therapy in Addison's Disease Clinical Considerations *J Am M Ass*, 1940, 114 2517

Treatment with synthetic adrenal cortical principle (desoxycorticosterone acetate) appears to be an efficacious form of specific therapy for patients with Addison's disease. During the past eighteen months, the authors have noted the effect of the substance on 30 patients under personal observation, in addition to 35 cases upon which reports have been submitted by cooperating physicians elsewhere. Striking and continued clinical improvement, with 20 patients leading a life of normal activity and working regularly, has been noted in 30 cases in the present study.

The uniform potency and stability of the crystalline product permit more exact regulation of the therapy. The relative inexpensiveness of treatment with the drug will permit most patients to afford adequate therapy. Desoxycorticosterone is one of several crystalline compounds which have been iso-

lated from adrenal cortical extracts. It is by no means certain that any one of the compounds thus far isolated represents the active form of the naturally occurring hormone. As tested by its potency in maintaining the life of adrenalectomized animals, desoxycorticosterone is the most active of all the compounds thus far identified.

To date, the drug has been restricted to the treatment of patients with classic signs and symptoms of Addison's disease. This therapy is indicated if patients with Addison's disease are unable to resume normal activity when treated with adequate quantities of sodium chloride and a diet low in potassium.

Clinical improvement was associated with a retention of sodium chloride and water, an increased renal excretion of potassium, a marked increase in plasma volume, restoration of the concentration of sodium chloride and potassium of the plasma to normal values, an increase in body weight, and an increase in both systolic and diastolic blood pressures.

After a patient has been maintained in good condition for a period of from six to eight weeks by means of a daily injection of desoxycorticosterone in oil and the daily quantity of the substance necessary for satisfactory maintenance has been determined accurately, subcutaneous implantation of the crystalline compound in pellets has been substituted successfully. This method of implantation not only obviates the necessity for daily intramuscular injections of the oily solution but also provides a more constant source of supply and results in a 30 to 40 per cent saving in the quantity required.

Crabtree, E G Pyelonephritic Injuries to the Kidney and Their Relation to Hypertension *J Urol*, 1940, 44 125

The finding of pathological pyelonephritic changes at autopsy in about 50 per cent of the patients who die of hypertension, the discovery of the deleterious effects of injured renal tissue in producing hypertension and of the effect of renal ischemia as demonstrated in the "Goldblatt kidney," and the recent recognition of a few cases in which improvement in the blood pressure has been noted following nephrectomy for chronic renal infectious disease have led to rapid application of the new information.

There is danger that renal tissue, that can all be spared, will be sacrificed on the altar of good intentions. Because of the fact that aside from clinical cases in which the final fate is not yet known, the only evidence to support destruction of a portion of the renal tissue of a hypertensive patient is based on animal experimentation and on autopsy findings, the author presents the results of a review of 30 cases of severe pregnancy pyelonephritis after a lapse of from ten to eighteen years following the initial infection. He also presents another series of 45 cases after a lapse of from five to ten years following the pregnancy infection. He found that in the first group only 2 of the 30 cases were hypertensive and concluded that hypertension is not the rule in severely injured pregnancy kidneys after the lapse of ten or

more rare. Hypertension was present in only 3 of 7 cases of pyelonephritis and in all of those which were complicated by toxemia.

D. E. MURRAY, M.D.

Kahle, P. J., Green, M. M. and Tomasley, G.: Staphylococcal Infections of the Renal Cortex. An Analysis of 5 Additional Cases of Carbuncle and 4 Additional Cases of Abscess. *J. Urol.* 94, 43-774.

This report refers to 5 new cases of carbuncle and 6 new cases of cortical abscess of the kidney observed on the Louisiana State University Service at the Charity Hospital of Louisiana at New Orleans in the three years ending September 30, 1939. The authors believe that these lesions of the renal cortex are not identical and do not, as some authors claim, represent separate stages of the same lesion. They may be single or multiple and clinically they produce symptoms which are almost if not entirely the same but pathologically they differ in many respects, as was seen in the case of a carbuncle of the upper pole of the kidney and multiple discrete abscesses elsewhere in the renal cortex. The abscesses were widely separated from the carbuncle and from each other and presented none of the characteristics of the carbuncle.

Both lesions are the result of blood-borne infection, but the carbuncle, because of its wedge shape probably arises from occlusion of an artery by a septic embolus; later the infarction goes on to suppuration. The abscess, on the other hand, is probably caused by bacteria which have lodged in a glomerulus without complete occlusion; later central necrosis and abscess formation occurs at this point. It is generally agreed that the origin of the renal infection is in primary focus, which may be so insignificant as to be overlooked or the history may not be taken with sufficient care to elicit its recent presence because the physician fails to realize the importance of the cause-and-effect relationship. Usual history of previous carbuncle, furuncle, paronychia, tonsillar infection, trauma or infection of simple cut is obtainable. 1 case in which history of suppurating skin lesions was obtained, periods varying from eight to twelve weeks had elapsed before symptoms of cortical renal infection appeared.

The carbuncle and the cortical abscess do not resemble each other grossly. The carbuncle is usually wedge-shaped and suppurative and separated from the cortex by wall of thick fibrous tissue. The suppurating areas may or may not connect with each other and the craters never contain much pus. The lesion is not fluctuant and feels hard to the touch. The color is generally dusky and livid, but the craters contain thick creamy or greenish pus. The base is somewhat raised and the overlying capsular tissue is thick and greatly indurated. The cortical abscess on the other hand, is round or oval, and fluctuates. When the lesion is near the surface areas of hyperemia surround it and it appears as dirty white or

creamy. The organism responsible was found to be the staphylococcus aureus.

In this series of cases there were 8 male and 3 female patients. In the 5 patients with carbuncle the age ranged from seventeen to thirty-two years, while with a single exception all 6 of the patients with abscess were in the second decade of life. None of the sites of the kidney seemed to be more often involved than another.

The majority of patients with carbuncle or cortical abscess had chills, fever, and costovertebral pain, with rigidity of the lumbar muscles although not all of these symptoms were present in all cases. Pain in the costovertebral angle was present in all cases and was aggravated by percussion or ballottement. The blood pressure was normal in all of the cases in which it was recorded. The pulse and respiration were in keeping with the febrile reaction.

In 9 cases the urine from the bladder contained no abnormal elements and the cultures were sterile. Tests for total renal function were uniformly normal. In all cases in which cystoscopy as done the bladder was normal. In 5 of the cases no deformity of the pelvis or calyces was seen by means of pyelography, but in 5 others definite changes were observed. Roentgenological examination done in

cases and the kidney outline was obscured by gas in 5 the kidney as normal in size in 3 cases, and enlargement was seen in 3 cases. X-rays are probably of more diagnostic value than the other results suggest, especially if pain, rigidity or excessive muscular development make it difficult or impossible to palpate the kidney. Valuable information is often obtained by visualization of the psoas muscles, which may be obliterated in cases of perinephric involvement with suppuration. In such cases lateral views, taken on inspiration and expiration, show little or no displacement of the kidney and even fixation. The leucocyte count in 3 cases ranged from 500 to 3,000 and the polymorphonuclears varied from 70 to 90 per cent. The leucocyte count was consistently higher and the polymorphonuclear neutrophile count as consistently lower in the patients with carbuncles than in those with abscesses.

The diagnosis of cortical infection is difficult early in the disease. It may simulate renal conditions, such as hypernephroma and closed pyonephrosis, or such retroperitoneal conditions as renal neoplasm, and perinephric abscess. It has been diagnosed influenza, pleurisy, typhoid fever, malaria, osteomyelitis, acute pyelonephritis, acute cholecystitis, hepatic abscess, subdiaphragmatic abscess, myelogenous leucemia, Banti disease, Gaucher disease and pancreatic cyst. The probability of cortical lesion of the kidney must be seriously considered when there are such signs, symptoms, and findings as pain in the costovertebral angle which is aggravated by palpation or by M. L. p. first percussion, more or less rigidity of the lumbar muscles, unexplained fever, high leucocyte count, and clear urine. The diagnosis is almost certain if a history

of a furuncle or other primary focus is obtainable. The presence of scoliosis, with the concavity presenting on the affected side, is a helpful finding in some cases, but it is more likely to be seen in perinephric involvement, with or without suppuration, than in the type of lesion discussed. Unless there are definite contraindications, cystoscopy and catheterization of the ureters should be done. Pyelograms are invaluable in differentiating a renal from a retroperitoneal mass. That a differential diagnosis between carbuncle and cortical abscess can usually be made does not seem reasonable.

In this series of cases, nephrectomy was done 6 times, twice for carbuncle, three times for abscess, and once for carbuncle and multiple abscess. Partial nephrectomy was done in another case of carbuncle. One case of carbuncle and 3 cases of cortical abscess were treated by incision and drainage. Spinal analgesia was used eight times and ethylene, nitrous oxide and oxygen, and cyclopropane in 1 case each.

The time of the operation is a most important factor in the outcome. In this series, in which there were no deaths, the duration of symptoms varied from one to twenty eight days before admission and the average time from admission to operation was five and four-tenths days. The symptoms were apparently more acute in cases of abscess than in those of carbuncle and the average time between admission and operation was four and five-tenths days in 3 of the 5 cases. In the 2 other cases the diagnosis was uncertain for seven and twelve days, respectively, after admission. LOUIS NEUWELT, M D

Parker, A E Lymph Collectors from the Ureters, Their Regional Nodes and Relations to Posterior Abdominal Lymph Channels. *J Urol*, 1940, 43 811

The purpose of this article is to present an anatomical description of the lymph vessels which drain the ureters as they have been marked out by means of an injection mass introduced into the ureteral wall. Throughout this study effort has been concentrated on observing if a continuity exists between the lymph channels of the bladder and those of the kidneys by way of the ureter.

Over 100 separate injections of various portions of the walls of ureters indicate that no complete network of lymphatic channels may be demonstrated throughout the walls of ureters by means of Gerota's injection mass. The lymphatic capillaries in the walls of the ureters give rise to lymph collectors which pass diagonally outward through the musculature of the ureters.

These lymph collectors course in the adventitial coverings of the ureters. They may pass upward and downward from the point of injection for greater or lesser distances. Eventually they always leave the renal ducts to pass to the regional lymph nodes.

The regional lymph nodes of the ureters belong to the lateral abdominal lymphatic chains, the common iliac, the external iliac, and the hypogastric groups of nodes. Lymph nodules located along the

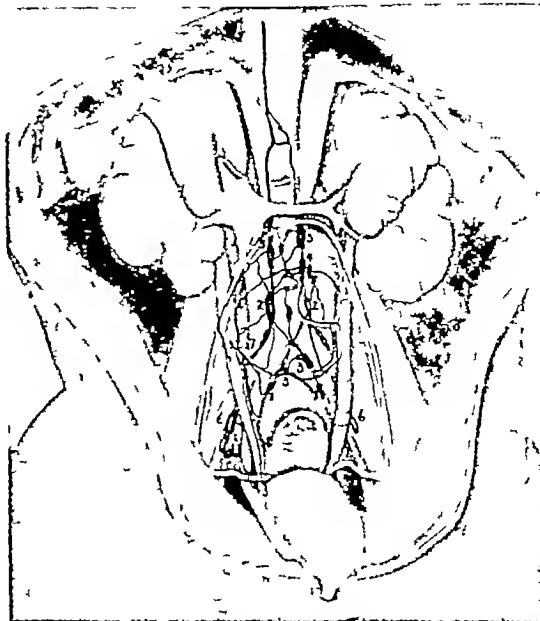


Fig 1 Composite drawing showing lymph vessels found draining middle thirds of ureters with their regional nodes and relationships of latter to thoracic duct and to pre-aortic cross connecting lymph channels. (Drawing by author.)

lymph collectors from the kidneys receive lymph vessels directly from the pelves of the kidneys. Except for the latter, no lymph nodes separate from the main posterior abdominal and pelvic lymph nodes were found to act as regional nodes for lymph collectors from the renal ducts.

JOHN A LOEF, M D

Gouverneur, R, and Aboulker, P Intestinal Implantations of the Ureters (Les implantations urétéro intestinales). *J de chir*, 1940, 55 481

Gouverneur and Aboulker discuss the indications for and the results obtained by intestinal implantation of the ureters. Of the various techniques described, that of Coffey is most widely used and has given the best results, as it best maintains the muscularization and valvular action of the lower end of the ureter. The chief indication for implantation of the ureters into the intestines is exstrophy of the bladder and hypospadias with complete incontinence of urine.

Of 66 cases of this type reported in the literature, 49 (75 per cent) have shown satisfactory results for more than five years, and 33 (50 per cent) for more than ten years. Among the women patients, several have borne children. The operation is indicated in vesicovaginal fistula only in cases of the severe type, in such cases the ureter is invariably involved in the inflammatory process. In 24 cases of this type collected from the literature, the intestinal im-

plantation of the ureters gave good results in 10 cases for more than three years and in 5 cases for more than five years of the women became pregnant and were delivered by cesarean section.

In cancer of the bladder intestinal implantation of the ureter permits complete removal of the bladder which is the only radical operation that may result in cure. The success of the ureteral operation depends upon the results of the cystectomy. In cases of cancer of the bladder in which this operation was done patients survived more than 1 year.

Case is reported by Fischel in which the patient survived eight years. A number of cases death was due to metastases or local recurrence of the cancer but the reno-ureteral function was "perfect."

In most cases in which the intestinal implantation of the ureters has given good functional results the urinary continence is good. Urine is passed not oftener than from three to five hours during the day and in some cases not during the night. The urine may be passed alone or mixed with some fecal material. The presence of the urine in the lower colon and rectum does not cause any irritation of the mucosa. This has been frequently demonstrated by examination with the rectosigmoidoscope.

ALICE M. M. VERA

GENITAL ORGANS

Heitz Boyer, M. The Role of Chronic Prostatitis in the Condition Called "Hypertrophy of the Prostate" (Rôle de la prostatite chronique dans la maladie dite "hypertrophie de la prostate"). *Mém Acad d'obst. Par.* 1940, 66-442.

On the basis of his clinical experience, Heitz Boyer distinguishes two types of hypertrophy of the prostate: the typical prostatic adenoma, which occurs most frequently in approximately 2/3 of the cases and hypertrophy that results from chronic inflammatory process and represents approximately one-third of the cases.

The typical prostatic adenoma develops in the anterior portion of the prostate in the periurethral glands; the posterior portion is not involved by the denomatous metaplasia. Inflammatory hypertrophy may develop in any portion of the gland. It is the result of an infection with the formation of small abscesses, which as the infection subsides do not heal completely but form small cavities these may later be reinfected, usually by the hematogenous route and then produce an inflammatory process in and around the small cavities or diverticula, followed by proliferation of the surrounding tissue with resulting hypertrophy. While prostatic adenoma develops in older men, after the age of fifty the inflammatory type of hypertrophy develops, as a rule, before the age of fifty. The urinary symptoms characteristic of prostatic adenoma are less marked in the inflammatory type; the latter rarely causes attacks of complete urinary retention such as occur in denomatous hypertrophy. The inflammatory type of hypertrophy is more apt to cause

obstruction in the upper urinary tract with retrol dilatation above the point of obstruction, sometimes complicated by hydrocoelephrosis. The inflammatory type is more apt to undergo malignant degeneration than the denomatous type. On rectal examination the enlargement of the prostate is not as great as in inflammatory hypertrophy as in adenomatous hypertrophy the surface is often irregular. The consistency is harder than that of adenoma without bowing the extreme stooe-like hardness of prostatic cancer. In addition to cystoscopy urethrography is of special value in the diagnosis of the inflammatory type of prostatic hypertrophy as it demonstrates the presence of the cavities or diverticula in the prostate.

The treatment of the inflammatory type of prostatic hypertrophy is surgical. Endoscopic treatment with high frequency currents, cutting as well as the coagulating current, is recommended. This technique has a quadruple effect in this type of hypertrophy: it removes the tissue obstructing the neck of the bladder; it destroys the cavities in the prostate; it disinfests the inflammatory foci and it has hemostatic action as the coagulating current closes the blood vessels and lymphatics and prevents any absorption of toxic material. This same method might be used as a preventive measure to destroy the infected cavities before hypertrophy has developed.

ALICE M. M. VERA

Hessline, R. B. Prostatic Calculi: Treatment by Subtotal Perineal Prostatectomy. *J. Urol.* 1940, 44, 146.

The cause and location of prostatic calculi are discussed and a subtotal perineal prostatectomy is described by means of which calculi, infection and the capsule may be cleared and completely removed. Complete removal of all the infected glandular tissue with the calculi by subtotal perineal prostatectomy should eliminate the focus of infection and offer permanent cure without complications. The possibility of subsequent impotence in cases in which it is not already present should be explained to the patient before surgery is instituted.

D. E. MICHAEL, M.D.

Barnes, R. W. Carcinoma of the Prostate: A Comparative Study of Modes of Treatment. *J. Urol.* 1940, 44, 69.

From a review of the literature, the author concludes it is difficult to determine the best treatment or combination of treatments for prostatic carcinoma. Six hundred and sixty four cases collected from different sources are reviewed in an attempt to arrive at some basis for therapy and the author concludes that there is slight advantage in the postponement of death in cases treated by high voltage roentgen therapy combined with other treatment, over cases treated without this therapy. Endoscopic electrosection of the bladder neck is the best treatment for urinary obstruction caused by prostatic carcinoma.

In this study there were no cases which underwent total radical perineal prostatectomy, but the author believes there are very few surgeons who could obtain results even approaching those reported by Young, and it is very doubtful that total prostatectomy would be as good a treatment in the hands of the average urologist as prostatic resection

D E MURRAY, M D

Colston, J A C The Surgical Treatment of Carcinoma of the Prostate *New England J Med*, 1940, 223 205

Carcinomas of the prostate can be conveniently divided into four main groups according to the author

Group 1 includes those cases with few, if any, urinary symptoms in which the growth has extended too far for complete radical excision. It is recommended that this group be treated by a combination of radium and deep x-ray therapy

In Group 2 are included those cases with varying degrees of obstructive symptoms and signs in which the growth has extended too far for any hope of complete operative eradication. This group was formerly treated by permanent suprapubic cystostomy, but the author is of the opinion that it can be treated best by transurethral resection or by enucleation through a perineal incision, the perineal prostatectomy being the method of choice

In Group 3 are included those cases without urinary symptoms in which the neoplastic growth has not extended beyond the capsule into the membranous urethra, or beyond the base of the seminal vesicles, but in which metastases can be demonstrated with the x-rays. These cases are best treated by a combination of radium and x-ray therapy

In Group 4 are included those cases which are suitable for Young's radical operation. Of 38 patients in the latter group in whom the pre-operative prognosis was favorable and who survived the operation, 50 per cent lived for five years or more after operation

D E MURRAY, M D

Eisenstaedt, J S, Appel, M, and Fraenkel, M The Effect of Hormones on the Undescended Testis *J Am M Ass*, 1940, 115 200

The careful evaluation of the position of the abnormally situated testis, which can be determined by painstaking examination, is important. The group of abnormally situated testes which invariably will descend when they reach or approach adult size and weight are to be differentiated clinically from the group of true undescended and ectopic testes. True undescended and ectopic testes always require operative treatment for their correction. Retractable testes may descend spontaneously as late as the seventeenth year

Gonadotropic substance has no value in the pre-operative care of true undescended and ectopic testes and its routine use for retractile testes is not recommended. It is definitely harmful in larger dosage to testes which have not reached the scrotum

Experimental animals have shown a characteristic response to endocrine therapy when the testes have been made cryptorchid. The gross appearance of these testes corresponds closely to that of undescended testes which have received a larger dosage of hormone and for which operation is subsequently required to overcome a mechanical cause for the failure to reach the scrotum. Operation was done in a series of 7 clinical cases showing marked evidence of degeneration after the use of hormone

The surgical correction of the undescended testis after endocrine therapy is not facilitated, as claimed by others, but rendered more difficult

JOHN A LOEF, M D

Gordon, W G Tumors of the Testis. A Study of the Pathology of 142 Cases of Primary Neoplasms of the Testis in Man *J Urol*, 1940, 43 851

The author analyzes 142 cases of primary neoplasms of the testis, and endeavors to interpret them from the standpoint of pathogenesis. Two principal features of the problem remain unsolved

1 Are practically all tumors of the testis of teratomatous origin, which would imply an origin in totipotent or multipotent cells or groups of cells, or may they arise from adult germinal epithelium as the result of anaplastic changes, without evidencing totipotent qualities?

2 What is the origin of the teratomas themselves, are they included twins, misplaced blastomeres, fertilized polar bodies, or do they arise by parthenogenetic reproduction of totipotent germ cells in the testis of the host?

The present study of well developed neoplasms cannot aid the solution of the second question. However, particular attention is given to the first problem in this series of cases

Special attention was given to the histopathology of the tumors, and to the presence of teratomatous structures. Any tumor was considered to be of teratomatous origin if there could be demonstrated in it tissues which could not have arisen from adult germinal epithelium or normal testicular supporting tissues, because of anaplastic or metaplastic changes, without considering it to be multipotent or totipotent. Therefore, such structures as striated muscle, cartilage, and mucin-forming columnar epithelium, or any malignant neoplasm derived from these, such as a mucin-forming adenocarcinoma, were considered evidence of teratomatous origin. The neoplasms were classified by morphology and no effort was made to determine the germ-layer of origin unless this was perfectly obvious from the neoplasm. A particularly careful search was made in the adenocarcinomas, and in the "embryonal carcinoma" (Ewing) or "seminoma" group, for evidence of teratomatous structures or intermediate changes from adult seminiferous epithelium to malignant neoplasms

Benign teratomas with relatively mature types of tissue were found in 8 cases

Embryonal carcinoma (E. fig.) without any other malignant neoplasm, occurred in 52 cases, and in 7 of these definite teratomatous structures such as cartilage, are found. The neoplasm as in each case entirely characteristic of the seminoma of Chevreau which is medullary neoplasm composed of large pale-staining spherical or polyhedral cells with very pale-staining cytoplasm without inclusion, and with distinct cell boundaries. The nuclei were large granular and deeply basophilic with granular chromatin and one or more nucleoli. Mitotic figures were frequent, and all neoplasms were of Grade IV malignancy (Broders). This group of neoplasms has been called "embryonal carcinoma" by Ewing. A transition stages are found between normal germinal epithelium and embryonal carcinoma, although the infiltration of the cell developed neoplasm into normal epithelium was confusing in few areas. The occurrence of lymphoid stroma not believed to be of particular significance as this feature varied enormously, in different parts of the same neoplasm and probably represented merely a stromal response. Study of this series, therefore, could support teratomatous origin, since despite marked overgrowth and necrosis, careful search revealed definite teratomatous remains in 7 of 5 cases. If the simultaneous occurrence with neither cellular type of neoplasm may also be used to favor the view of teratomatous origin, an additional 5 cases may be added, of undifferentiated carcinoma and 3 of adenocarcinoma.

Adenocarcinoma was the only malignant neoplasm present in 47 cases; its teratomatous origin was proved in all but 4 cases. In 3 additional cases adenocarcinoma was associated with another malignant neoplasm. The cellular types and grades of anaplasia varied greatly, from undifferentiated adenocarcinoma to fairly well differentiated papillary mucin-forming carcinomas. A transition stages are seen between the normal germinal epithelium and adenocarcinoma, and no adrenal rest neoplasms are recognized.

Undifferentiated carcinoma the only malignant neoplasm present in 9 cases, and in 6 of these there are teratomatous structures. In 3 additional cases undifferentiated carcinoma was associated with another malignant neoplasm. The cellular type is richly closely approached embryonal carcinoma in some of the undifferentiated carcinomas but lacked the essential characteristics of that group and evidenced considerable variation in cell type.

Chorio-epithelioma was the only malignant neoplasm present in 3 cases and in 3 cases chorio-epithelioma was associated with adenocarcinoma. The tumors were all considered to be of trophoblastic origin and to have arisen in teratomas. Histologically they are characterized by hemorrhage and necrosis, and all contained typical syncytium and cells of the Langerhans type.

Sarcoma as the primary neoplasm in 8 cases. Of these 5 presented lymphosarcomas and there was no certainty as to their being "primary neoplasms

of the testis. Sarcoma was associated with carcinoma in 3 additional cases. A teratomatous structure could be found in any of them, nor was there any history of primary testicular tumor. For this reason these cases should probably have been excluded from this series.

Of the remaining 6 sarcomas 2 were rhabdomyosarcoma of proved teratomatous origin and of these 2 associated with adenocarcinoma 1 was spindle-cell sarcoma with no proved teratomatous origin and the remaining 3 were undifferentiated sarcoma of these, 2 were associated with carcinoma. Probably all of the sarcomas listed with exception of the lymphosarcomas, may be considered true primary sarcomas of the testis. A teratomatous origin could be proved in all but 1 of these cases.

Of the miscellaneous neoplasms rare tumors could not be interpreted with certainty. One as an endothelial sarcoma, without proof of teratomatous origin the other was a hypernephroid carcinoma both suggested adrenal cortex in certain areas, but was highly undifferentiated in other places. The other is not prepared to diagnose it as neoplasm arising in an adrenal rest. Examples of interstitial cell tumors of the testis are found in this group. LOUIS NACIAS, M.D.

Bell, J. S., Kurland, I. and Jacob, M. J. Hormone Secretion and Bio-Assay of Extirpated Tumors in Testis of the Testis. *Endocrinology*, 34, 20, 1945.

A case of malignant teratoma of the testis containing chorio-epitheliomatous element is reported. By employing an adaptation of the Aschheim-Zondek test for pregnancy qualitative determinations of urinary hormone excretion were made. During the course of the patient illness the hormone excretion and clinical condition were closely parallel. Before treatment the hormone excretion greatly elevated and both follicle stimulating and luteinizing effects were demonstrable. After radiation and orchiectomy the hormone concentration diminished and the luteinizing effect disappeared. However, the metastatic extension of the malignant process the hormone excretion again increased and before the patient died the luteinizing effect had returned.

The hormone content of the extirpated testicular tumor also possessed follicle stimulating and luteinizing action.

The authors suggest that the luteinizing factor which was found pre-operatively in the urine and later in the extract of the tumor related to the presence of incompletely developed fetal elements within the tumor. ELLIOTT W. C. SMITH, M.D.

MISCELLANEOUS

Meeker, S. R. Male Infertility from Gynecological Viewpoint. *J. Clin. Endocrinol.* 3, 37.

It is no longer generally recognized that defects in the male are almost if not quite as frequent and im-

portant as those in the female in the causation of conjugal infertility

The first point to be emphasized is the fact of multiple causation. There is a long list of abnormal conditions, genital and constitutional, which exert a depressing effect upon reproduction. The author finds the number of these abnormalities to range from 2 to 9 (average about 4.75 per case).

These factors fall into 2 groups. The first includes conditions of which any one by itself is sufficient to prevent conception, such as complete blockage of the genital passages or complete failure of gametogenesis. An absolute factor of this sort is found in about 30 per cent of sterile matings, but its presence by no means guarantees the absence of other factors of infertility. The second group of causative factors includes conditions that depress fertility more or less without entirely obliterating it, and their effect is relative rather than absolute. Some of these factors are only mildly depressing and one or two of them may be found in couples of proved fertility, but if the number rises above two, the total impediment is likely to be too great for Nature to overcome. This last possibility happens in about 70 per cent of the clinical cases of sterility, each one of the multiple relative factors lowers the fertility to some extent, and all of them together depress it below the threshold of conception.

A more important possibility is the frequency of divided responsibility. Investigations have shown that only 1 husband in 10, and only 1 wife in 20, fail to show at least some objective evidence of infertility. The ordinary clinical case is not that of a perfectly fertile man mated with an absolutely sterile woman or *vice versa*, it is rather the case of two relatively infertile individuals, the sum total of whose combined disabilities is great enough to cause infertility. The author has devised a method of estimating the division of responsibility between the two partners. The fertility of each individual is evaluated and given one of three ratings: good, intermediate, or poor. The male evaluation is based chiefly, though not entirely, upon the quality of the semen. A good specimen (MG) should have a sperm count of 60,000,000 per c cm, a motility of at least 70 per cent, and not more than 20 per cent of abnormal forms. An intermediate specimen (MI) should have a sperm count between 20,000,000 and 60,000,000, a motility from 20 to 70 per cent, and from 20 to 30 per cent of abnormal forms. If a specimen does not meet the minimum requirements for the intermediate classification, it is rated as poor (MP). In a series of 100 consecutive cases of sterility these groups were found to be present in the proportion of (MG) 14, (MI) 59, and (MP) 27.

Female fertility is similarly classified as FG, FI, and FP. Good female fertility means the absence of all demonstrable abnormal factors, except perhaps some single condition, such as mild endocrinopathy. The intermediate group includes women with one or more moderately severe factors, such as lesser degrees of genital hypoplasia, viscosity of the endo-

cervical mucus, partial tubal obstruction, and retention cysts of the ovaries. A poor rating most often means marked genital hypoplasia or complete tubal occlusion. In the same 100 cases already cited the proportions of the three female groups were (FG) 8, (FI) 58, and (FP) 34.

The purpose in establishing standards for semen is to provide criteria for estimating a man's chances of impregnating the average woman of good fertility. One difficulty is the fact that in the same individual seminal values commonly vary from time to time, in some cases these variations occur rapidly, to a marked degree, and without appreciable cause, as in the case of the one-child marriage. Another difficulty arises from the variations in different men of proved fertility. Various grades of seminal value are consistent with successful reproduction.

Numerous physical and chemical deviations from the normal semen are of small practical importance. Volume is insignificant except when it is extremely reduced. A large sugar content and the presence of crystals are probably results rather than causes. Leucocytes and bacteria are surprisingly innocuous as far as contact with spermatozoa is concerned. An important abnormality is deficiency of the mucolytic enzyme, as shown by failure of a specimen to liquefy after ejaculation, which results in the entanglement of spermatozoa in their own medium and in their failure to penetrate the endocervical mucus. The improper technique and production or handling of the specimens may be a source of error. There should be a complete orgasm, without which the contents of the vasa deferentia will probably not appear in the ejaculate. Most condoms carry substances capable of depressing the motility of spermatozoa. The optimum temperature for preserving the vigor of specimens is not that of the body, but from 8° to 20°C.

The causes of abnormal semen may be divided into two groups: (1) conditions preventing the testicles from producing normal spermatozoa, and (2) conditions in the male genital tract interfering with the safe passage of spermatozoa from the testicles to the urethral meatus. Deficient spermatozoa may be due to hypoplastic, temporarily underactive, or permanently damaged seminiferous tubules.

Female genital hypoplasia is manifested by characteristic anatomical stigmata and menstrual disturbances. Comparable results may occur in the male, but their diagnosis is difficult. The size of the testes is not a reliable criterion. An undescended testicle may be associated with more or less severe hypoplasia of the seminiferous tubules.

Testicles not atrophic, hypoplastic, or otherwise permanently damaged may suffer a depression of their spermatogenic function as a result of either local or constitutional conditions. Frequency of coitus is not detrimental to fertility except in great excesses and is usually only temporary. Hence, continence is not to be recommended to improve the quality of the semen. A large varicocele may cause chronic passive congestion of the testes, but this

factor is assessed by the therapeutic test of a suspension with follow-up tests of the semen. In undescended testicles some benefit of orchopexy is due to the relatively cool environment of the scrotum.

The constitutional conditions influencing spermatogenesis are varied, numerous, and frequent. Their aggregate importance in infertility far out-weighs that of the anatomical lesions of the male genitalia. States of poor general health and faulty hygiene produce subnormal reproductive performance and the harm induced depends not only upon their severity but also upon the resistance and the defensive reactivity of the testicles or ovaries. The correction of constitutional abnormalities, infected tonsils, insufficient exercise or mild anemia without treatment of the genitalia, often results in improved metabolism, better semen, and pregnancy. The disorders of this group include chronic intoxication, general debility, metabolic disturbances of extrinsic origin, and endocrinopathy. Alcoholism, plumbism, morphinism, malaria, syphilis and chronic focal infections, such as prostatovesiculitis, may be responsible for infertility. Anemia exerts a peculiarly depressing effect upon male and female gametes. The "tired business man" often profits from long vacation and return to nature. Metabolic disturbances of extrinsic origin result from conditions outside of the proper economy of the body, particularly from faulty diet and insufficient exercise. With regard to diet, protected low intake of nitrogen results in cellular malnutrition and the sex cells are among the first to suffer. The taking of additional vitamins is not necessary with a well rounded diet. Iron is useful in anemia. Vitamin E may help habitual abortion, but it does not seem to increase fertility in human beings. Seminal deficiencies occur in overfed and underexercised males, and in indoor workers leading sedentary life. In the latter the deficiencies are often amenable to a properly regulated hygiene. Obesity and infertility are often associated, although they bear no causative relationship to each other, both are due to the same subnormal metabolic activity.

Reproductive endocrinology. Interest centers around the pituitary-gonad mechanism, but infertility may be due also to disorders in other parts of the endocrine system, such as thyroid insufficiency in which cases thyroid preparations are often efficacious. Insufficiency of the gonadotropic hormone of the anterior lobe of the pituitary gland during puberty results in hypoplasia of the adult life. It depresses both the endocrine and the excretory function of the testes, and spermatogenesis becomes imperfect. Pituitary deficiency and hypogonadotropism should be suspected whenever the spermatozoa are subnormal in number, motility or morphology without other explanation of the trouble. The history, general physical examination, and laboratory tests should also be considered. Negative findings are less significant than positive because slight pituitary deficiency may have profound influence on the testes. Since the amount of gonad-

tropic hormone excreted normally in the urine is small, it may be considered insufficient only when it is reduced to the vanishing point. The preparation available for therapy include the pituitary glands of animals, the urine of pregnant women, and pregnant mare serum. The objective findings helpful in the diagnosis of deficiency of testicular hormone are gross stigmata of hypogonadism, feeble sexual desire and poor coital performance. Small volume or increased viscosity of the semen may be due to inadequate stimulation of the accessory gland. Testosterone or rather androsterone is excreted in the urine, where it can be quantitatively determined. The greatest field of usefulness of the androgenic substances is in cases of subnormalities of the semen not due to deficient spermatogenesis. Of the synthetic preparations, the most satisfactory is testosterone propionate.

Various diseases and injuries may irreparably damage the testes, such as the orchitis complicating mumps which causes atrophy of the seminiferous tubules. The effects of such disaster can be diminished by multiple incision of the tunica albuginea in the early stage of the disease.

The second major group of causes of seminal abnormality includes conditions which impede spermatozoa during their passage from the testes to the external meatus, either by blockage or by unfavorable environment. The presence of even a few spermatozoa rules out complete obstruction of the male passages. Azoospermia, on the other hand, presents difficulties in diagnosis. Is there failure of spermatogenesis or mechanical blockade? The therapy depends upon this answer. There are three methods of approach: (1) puncture and aspiration of the testes; (2) entry into the globe major of the epididymis; and (3) testicular biopsy. The recovery of spermatozoa proximal to the duct system of the testes indicates obstruction in that system. Since testicular puncture yields spermatozoa in only 60 per cent of presumably fertile men, a negative result is inconclusive. Open exploration of the epididymis allows immediate epididymovasostomy if obstruction is demonstrated. Testicular biopsy not only shows the presence or absence of spermatozoa in the seminiferous tubules, but also gives evidence of functional activity in the germinal epithelium. The commonest site of obstruction is the lower pole of the epididymis; the obstruction is usually due to gonorrheal infection. Before doing epididymovasostomy the vas deferens and ejaculatory duct should be investigated for patency (1) by passing strand of silk worm gut through them, (2) by catheterization through the posterior urethroscope or (3) by means of rays and the injection of an opaque medium.

Chronic prostatovesiculitis may depress spermatogenesis. It does not seem likely that spermatozoa are damaged by direct contact with bacteria or pus in the semen, but prostatovesicular coagulation tends to make the seminal fluid abnormally viscous and creates an unfavorable medium.

Faults of delivery and reception of the semen may be due to an inadequate number of spermatozoa or an unfavorable environment in the female genital tract. The latter may be due to various conditions in either sex. The ideal environment is the alkaline mucus of the endocervix, the acidity of the vagina is definitely hostile to spermatozoa. Therefore, spermatozoa should be delivered to and received by the cervix as directly as possible. For the diagnosis of faults of reception and delivery the Huebner test is very useful. The wife reports two hours after natural coitus, and mucus from her cervical canal is immediately studied microscopically with special reference to its content of male cells. Normal spermatozoa, deficient spermatozoa, or none may be found. A satisfactory finding is from 2 to 20 spermatozoa per high-power field, most of them actively motile, this rules out faults of delivery and reception and indicates favorable endocervical secretions. When the cervix yields spermatozoa deficient in number, motility, or structure, the fault lies probably in hostility of the endocervical mucus because of excessive viscosity, which is obvious both grossly and microscopically. A seminal specimen should be studied to determine whether the semen itself is responsible. When no spermatozoa are recovered, careful investigation of both partners, together with a study of the semen, will identify the precise nature of the trouble. With an unsatisfactory postcoital examination, repeated tests should be made to rule out psychological or mechanical accidents.

Incomplete coitus is the most obvious fault of delivery. Impotence and premature ejaculation are due

to an anxiety neurosis more often than to a pathological condition of the genital tract, and psychotherapy is the most hopeful means of treatment. Partial impotence should not be confused with aspermia from organic causes. The male is primarily to blame in faulty sex hygiene, especially for inadequate pre-coital stimulation of the wife, as a result of which the thick plug of "exocervical" mucus is not expelled but serves as an insurmountable barrier. Besides, unsatisfied desire in the female leads to chronic passive congestion of the pelvic organs, abnormal secretion in the endocervical glands, and degenerative changes in the ovaries.

Simple mechanical difficulties are created by anatomical conditions, such as a stricture of small caliber and hypospadias. Maladjustment or disproportion of the genitalia may be overcome by an altered technique of coitus. If conditions preventing the safe arrival of spermatozoa in the cervical canal cannot be eliminated, artificial insemination is alternative therapy. The insemination of a woman with her husband's semen has two indications: a fault of delivery and reception, and hostility of the endocervical secretion. The two contraindications are subnormality of the semen, and factors of sterility in the supracervical female genital tract. The injection should be intracervical in cases of faulty delivery and reception, and intra-uterine if there is viscosity of the endocervical mucus. The best time ranges between the twelfth and fifteenth days after the beginning of a menstrual period. The procedure should be repeated many times if necessary.

LOUIS NEUWELT, M D

SURGERY OF THE BONES JOINTS MUSCLES TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Chandler F. A. Observations on Circulatory Changes in Bone. *Am J Roentgenol* 940, 44, 90.

Except for the rare instances of tumors rising from the blood vessels, the relation of bone to the circulation is one of growth, necrosis, and of altered nutrition. The normal physiological functioning and survival of bone as of other body tissues and cells are dependent upon an adequate flow of intercellular fluid. This, in turn is dependent upon an adequate blood supply of both the arterial and venous systems. When vascular anastomoses are widespread, as in congenital arteriovenous fistulae or in extensive nervous formation, tissue growth is accelerated. When the blood supply is insufficient because of impaired venous return physiological processes are impaired and tissues degenerate both physiologically and structurally and produce the pathological picture of necrosis.

Bone must not be considered an inert substance but one of the most specialized tissues of the body consisting of active cells which respond promptly to the physiological demands upon the skeletal and hematopoietic systems. The circulation of bone is sufficient to supply the normal variations of physiological processes, but frequently there is failure of response to the extreme insults of trauma or infection.

The embryology of the circulation of bone is reviewed. Nutrient vessels enter the diaphysis and each end of the long bone. These areas are separated by the development of the epiphyseal plate which is not penetrated by blood vessels until its disappearance at completion of growth. The epiphysis receives its nutrition from blood vessels which enter at the epiphyseal line at which the capsule is originally attached. As the demands of muscle leverage and range of motion develop, migration of the capsular attachment occurs.

The development and pathological physiology of the head of the femur are discussed in some detail. The reaction of the femoral head to complete and incomplete interruption of its blood supply is similar to that of any area with limited anastomotic connections. The cellular element shows early necrosis. Osteoblastic cells disappear from their position along the bone trabeculae which surround the marrow spaces. The marrow spaces are filled with fine precipitate of necrotic material or later with fibrous tissue. The bony trabeculae gradually absorb and collapse under the pressure of weight bearing or muscle pull. The treatment of such aseptic necrosis is prolonged protection from compression strains during the slow processes of revascularization and replacement of bone.

HAROLD C. OCHSNER, M.D.

Moehlig, R. C., and Schreffler F. Polyostotic Fibrous Dysplasia. *Am J Roentgenol* 940, 44

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Polyostotic fibrous dysplasia is a skeletal disease which has been described in the literature under a variety of designations, including osteodystrophia fibrosa unilateralis, osteitis fibrosa localisata, osteodystrophia fibrosa generalisata, fibrous osteodystrophy and osteitis fibrosa disseminata. Recent roentgenographically the osseous changes simulate those of hyperparathyroidism but blood studies fail to show the characteristic findings associated with that condition.

The authors present a detailed case report of a sixteen-year-old male having extensive involvement of the skull and of the femur tibia and fibula of one extremity. The biopsy findings of one of the lesions operated on are given. On the basis of a comprehensive family history as well as associated findings in the patient, it is thought that hereditary dysplasia played a significant role in producing

unilateral mesenchymal bone defect in the form of polyostotic fibrous dysplasia. The opinion is advanced that the unilateral involvement of the skeleton was due to an unbalanced chromosomal aberration, the defect having been inherited from the maternal side.

ABRAHAM HARRIS, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Bertola, V. J., and Ordóñez Ferrerira, H. Osteotomy for the Correction of Ankylosis Resulting from Union of Hip Fractures (Osteotomía correctora en anquilosis de la cadera. Única en mala posición). *Bol. y trab. Soc. de ciruj. de Córdoba*, 940, 5

Rhes Barton in 1865 was the first to recommend corrective osteotomy for the treatment of ankylosis of the hip. Linear or edge-shaped osteotomies can be performed on the femoral neck, through the trochanters or in the subtrochanteric region. The author obtained good results in 3 cases after oblique subtrochanteric osteotomies. The operations are performed under local anesthesia. After the operations the patients are placed in body cast for from four to eight months, the length of time depending on the roentgenological findings.

JOSEPH K. NARA, M.D.

Haddart, G. E. The Surgical Treatment of Degenerative Arthritis of the Knee Joint. *J Bone & Joint Surg* 940, 77

The basis for the operation described by the author is established by a presentation of pathological studies correlated with the author's clinical experience. In discussing degenerative arthritic lesions of the knee two features are stressed: (1) the

incidence and severity of degenerative arthritic changes in knees markedly increases after the age of thirty, and (2) the patella and patellar surface of the femur are almost invariably involved

The author observes that roentgenograms of the knee are remarkable in that they rarely give an accurate idea of the degree of degenerative change which is present and, in particular, they give no indication of the extent of cartilage erosion

Of a series of 20 patients with pronounced disability from degenerative arthritis on whom surgical treatment was carried out, 19 experienced marked amelioration of symptoms after treatment. The only failure was in a patient with a mixed lesion in which rheumatoid arthritis predominated and was not recognized as such pre-operatively. It is believed that these patients are not helped by extensive surgery. Hence, one of the author's criteria for the selection of patients is to exclude rheumatoid arthritis. The other outstanding requirement is co-operation of the patient, inasmuch as the post-operative regimen is initially painful and the exercises frequently tedious

No extensive course of conservative treatment is believed to be necessary before operation, but a course in weight reduction, muscle training, and development of muscle tone is instituted before operation and is continued afterward

Two operative incisions are pictured. A median parapatellar incision was used in 19 of the reported cases. Subsequently, the author has used a vertical incision centering over the patella. Experience indicated that patients with an incompletely excised patella and those in whom the patella had been covered with fascia had no better results than those in whom the patella was completely excised, therefore the patella is now completely removed. The hyperplastic synovia is removed from all accessible portions of the joint compartment together with the alar fat pad. Either or both menisci, if damaged, are removed, and exostoses and other productive bone changes about the articular margins are cut away. The capsule is then closed with interrupted silk stitches, the subcutaneous tissue with interrupted plain catgut, and the skin with interrupted silk. The postoperative dressing includes a large cotton pad about the knee, and in the majority of the patients a long leg cast is applied

The cast is removed after five or seven days, muscle exercises are then resumed and physical therapy is started. Manipulation of the knee under intravenous pentothal anesthesia is carried out within three weeks after operation and before discharge so that adhesions may be broken up and a more rapid return of function is ensured

The average age of the patients presented was fifty six years. The follow up ranged from nineteen months to five years and, with 1 exception, all of the patients were benefited and had returned to their previous occupations, no patient complaining of pain comparable to that present before the operation

HOMER PREASANT, M D

White, J W Congenital Flat-Foot A New Surgical Approach *J Bone & Joint Surg*, 1940, 22 547

A surgical procedure for the correction of the congenital flat-foot too severe for conservative therapy is presented. By congenital flat-foot the author means the severely pronated and abducted long, narrow foot, which lacks to a large extent the plantar concavity of a normal arch. The excessive length of the astragalar neck and the discrepancy in the length of the inner and outer borders of the neck of the astragalus are responsible for the certain type of flat-foot for which the presented operative procedure is recommended. The purpose of the operation is to shorten the inner and lengthen the outer border of the foot

This type of flat-foot should be first treated conservatively, and it is advised that the operative procedure be deferred until the early "teens" as the deformity is not well established before that age. This fact strongly indicates that the deformity is the result of a growth disturbance, a reverse mechanism probably causing the club foot

The diagram and caption explain the operative procedure. The author emphasizes that the "warping up" or "buckling" of the inner and under borders of the foot is done in a safe manner that adequately corrects the valgus deformity where it

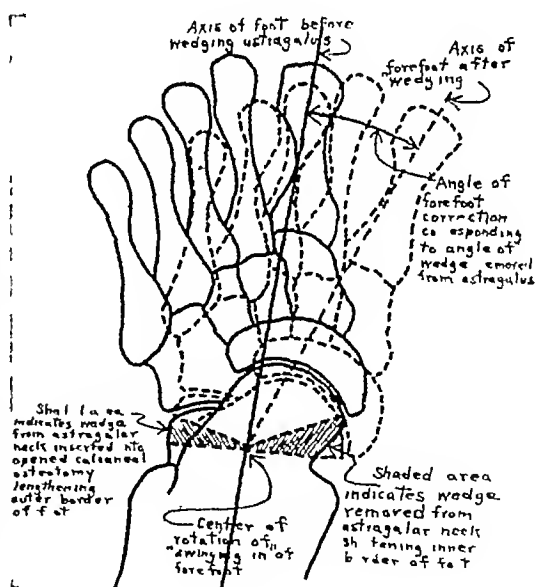


Fig 1 Tracing of roentgenogram of a severely pronated foot suitable for surgical correction. Dotted outline shows position of "forefoot" after closure of wedge removed from astragalus neck, which is inserted into the opening made by the calcaneal osteotomy. The transverse osteotomy must be carried all the way across the astragalus neck, and the anterior osteotomy to complete the wedge must be directed toward the "center" of the foot at this point ("center of rotation" in the tracing)

actually begins and that this is done without seriously disturbing any articulation or subsequent growth.

ROBERT P. MORTIMER, M.D.

FRACTURES AND DISLOCATIONS

Hinton, D. and Steiner, C. A. Fractures of the Ribs. *J Bone & Joint Surg* 91A, 197

An analysis of 379 cases of fracture of the ribs showed that 23 patients (76 per cent) were injured by a tomobiles, and 74 patients (6 per cent) were between the ages of thirty and sixty. Males predominated over females in a ratio of 3.5 to 1 and the ribs 5 to 9 inclusive were the most commonly injured.

The authors believe that roentgenograms taken in three positions, central, and right and left oblique views, have proved the most satisfactory and they suggest that in case of doubt and negative roentgenograms a diagnosis can be made on clinical evidence alone.

The majority of these injuries can be treated by adhesive strapping which should be applied in expiration and from below upward. The strapping should extend all out the sound side both anteriorly and posteriorly. Other methods of treatment are described by the authors, but were used infrequently.

Hemothorax was the most frequent complication occurring in 39 patients of the series. Aspiration or other curative treatment as rarely required in those cases in which the bleeding is pulmonary but if the hemorrhage came from an intercostal or internal mammary artery ligation is often necessary and was occasionally aided by rib resection.

Subcutaneous or intermuscular emphysema occurred in 3 patients. It was not serious complication and was usually controlled by local pressure and trapping.

Mediastinal emphysema was infrequent but dangerous case occurred in this series. It followed a tension pneumothorax and torn mediastinal pleura. With supervening hemorrhage and shock treatment as almost too late, hence the authors stress early recognition and treatment. Air was aspirated from the traumatic pneumothorax space until negative traqueal pressure of from minus 7 to minus 9 was reestablished and the shifted mediastinum restored to normal central position. If repeated aspirations are necessary the thorax used fixed needle and tube system to provide water-seal drainage.

In crushing injuries of the chest with the development of dangerous degree of anoxemia and secondary shock, book traction applied to the sternum is recommended the procedure is described.

In concluding the authors list the causes of death in 20 patients. Pulmonary complications are responsible for 6 deaths, 6 more resulted from skull fractures and 4 from multiple injuries. The remaining 3 deaths were due to cerebral injury.

HOMER FRANKLIN, M.D.

Severin, E. Early Treatment of Congenital Dislocation of the Hip (*Frühbehandlung der angeborenen Hüftgelenkluxation*) *Vord Med* 940, p. 59.

Severin criticizes the practice which has been followed for long time in Sweden of not treating patients with congenital dislocation of the hip before the age of 1 or three years (Pattil Haglund). He reports the results of a study made in 1930 at Vanförsenstalten in Stockholm. Of 337 patients with a total of 436 hip joints with congenital dislocation only 3 (7 per cent) were in good condition after earlier treatment. There were 63 cases (5 per cent) in which the hip joints were slightly displaced but in satisfactory anatomical position according to the roentgen ray examination. Severe secondary changes had occurred in 33 cases (5 per cent) and the hip had become dislocated again in 60 cases (5 per cent). These distressing results led the author to demand the earliest possible treatment.

In contrast to the early "orthopaedical exaggerated immobilization" with plaster body cast and plaster dressings extending over the knee which produced extreme abduction and internal rotation, the author recommends the procedure of Waldenström which fixes the hip joint, after reduction in position of 60 degrees of abduction and from 90 to 100 degrees of flexion, and allows free rotation and enough motion in the hip joint to permit opposition of the foot. The circulation and the condition of the muscles are improved. After from three to four months the child goes home with crutches and the hip is held in abduction at night and in position of rest the middle of the day. At this time physical therapy is begun and the child gradually begins to walk step by step. This plan is continued for from six months to a year. The advantages of early treatment are manifested by the easier and less painful reposition and by the better development toward normal of the head, neck and lower parts. In other cases the reverse occurs in the sense of differentiation.

The method of Pattil of Bologna which was first used for early treatment is recommended. This method is started before the sixth month and eliminates the so-called "prelaxation, or inclination toward slipping, of the joint by simple abduction and by placing of the children in frame with fixation in abduction. The results are very good.

If foreign countries try the importance of early diagnosis is recognized and the previous suggestion of an obligatory roentgen study even in public expense will be found less expensive for the community and family in cases of congenital dislocation of the hip.

Good results were obtained with the method at Vanförsenstalten in the case of a twenty-month-old child who was admitted in plaster cast with 90 degrees of flexion and 20 degrees of abduction in both hips. The angle of fixation was gradually reduced.

In concluding, the author once more demands early diagnosis and early treatment of this condition.

(ROCHTER) EDWARD W. GROSS, M.D.

Maróttoli, C R Excision of the Patella in the Treatment of Recurring Dislocation of This Bone (La patelektomia en el tratamiento de la luxación recidivante de la rótula) *Bol y trab Acad argent de cirug*, 1940, 24 286

In recurring dislocation of the patella, the surgeon is faced by the problem of selecting one of the numerous interventions which have been proposed and many of which rest upon poor or unphysiopathological grounds. All clinical observations show that these dislocations can be divided into three groups: traumatic, congenital, and habitual; these are differentiated etiologically by the severity and the definiteness of the traumatic factor and anatomically by the degree of previous morphological changes in the articular apparatus of the patella and of the bones of the lower extremity. Experience has shown that the bony changes belong nearly exclusively to congenital dislocations and that they are rare and of slight degree in habitual dislocations; on the other hand, habitual dislocations always present changes in the soft tissues of the joint, the most frequent and important being an upward displacement of the patella and an elongation and relaxation of the patellar tendon ligament apparatus. Evidently, these findings should determine the choice of the intervention.

Numerous publications reveal that plastic operations on the capsule and ligaments, with or without internal displacement of the tibial insertion of the patellar ligament, are incapable of definitely curing the disorder. In addition, although the plastic operations on bone, tendon, or capsule have been tested successfully on a large scale, it must be admitted that they offer various disadvantages and may result in failure; they require a prolonged period of postoperative treatment to obtain functional recovery of the patellar joint and this recovery is only partial in a large percentage of cases, pain persist-

ing in some of them, finally, in case of failure, the dislocation recurs. Besides, in many patients who are considered clinically cured, the patella is not in normal position in relation to the lower extremity of the femur and this may result in degenerative and hypertrophic processes of the cartilage similar to those found in chronic deforming arthritis.

From the ontogenetic and phylogenetic points of view, the patella is a regressing bone; its functional importance in man is relative, and experience has shown that its absence does not decrease the extension power of the knee; it increases the speed of the extension. All these reasons led Maróttoli to decide in favor of extirpation of the patella in recurring dislocation. His technique is simple and can be used under local anesthesia, spinal and general anesthesia are reserved for special cases. The incision may be vertical or horizontal and does not have to exceed 5 cm. The prepatellar aponeurosis is cut vertically and dissected on both sides; the fibers of the quadriceps tendon are cut transversally over the center of the patella and detached parosteally; the patella is removed and the quadriceps tendon is sutured to the patellar ligament by means of separate chromicized catgut sutures, care being taken to include the lateral aponeurotic expansions of the tendon that may have been cut; the superficial aponeurosis is sutured with plain catgut, and the skin wound is closed. The knee is immobilized with a plaster cuff and the patient begins to walk one week after the operation; the plaster appliance is removed after one month and the patient exercises the knee in bed and is given thermotherapy. Usually, from eight to ten days later, he resumes walking, the knee being protected by an elastic cuff only. As a rule, functional recovery is complete two months after the intervention. Five cases are reported.

RICHARD KEMEL, M D

THE PATHOLOGICAL PHYSIOLOGY OF VARICOSE VEINS

Collective Review

RICHARD E. HELLER, B.S. M.D., Chicago, Illinois

DISEASES of the peripheral vascular system have received an ever-increasing amount of attention in recent years. Affections of the veins have been studied in great detail and a staggering mass of literature has accrued. Being especially interested in the varicose-vein syndrome we have assembled the available material pertaining to its physiology. A striking variation in opinion concerning commonly accepted facts is noted. It seems that a summary of these papers would present a timely panorama of concepts and discrepancies in current opinion. Before considering the pathological physiology of varicose veins, it may be well to review certain fundamentals of the normal circulation of the leg.

NORMAL VENOUS CIRCULATION

Blood returns to the heart from the leg by two sets of veins: a deep group enclosed by fascial planes and muscles, and a subcutaneous or superficial network. These two units are interconnected by numerous communicating and anastomotic vessels forming a plexus through which blood may return to the vena cava by several routes. All of the veins are fitted with bicuspid valves which allow the blood to flow from the superficial to the deep vessels and then toward the heart, but not in the reverse direction (Luschka). Friedreich observed, in the dissection of 185 bodies, that valves often occur as high as the external iliac (35 per cent of cases) but rarely in the common iliac (4 per cent of cases).

The circulation of blood through these channels is influenced by a number of factors. The rate of flow depends on the blood volume and viscosity, capillary pressure, caliber of the vessel and the hydrostatic head above the capillary bed (Gollwitzer Meier, Franklin). Blood moves through the arteries at a rate of about 2 in. per second through the capillaries $1\frac{1}{4}$ in. per second, and through the veins about 8 in. per second (Glenn). The heart gives the blood column an initial impulse which is vitiated in passing through the capillary bed because of peripheral

resistance. The increase in venous velocity must therefore be due to other factors which are not arterial in origin (Eyster).

The velocity of blood in the veins is inversely proportional to the back pressure or hydrostatic head of the long column of blood which, in the erect position, extends up to the right auricle. In the horizontal position the effect of gravity is eliminated and the intravenous pressure falls (Villaret, Saint-Giron, and Salas) so that much less energy is required to maintain blood flow. It is evident that gravity in the erect person exerts a profound influence on the return of blood from the legs.

How is the effect of gravity overcome? Jacobson, about seventy-five years ago, made a study of venous pressures in sheep and found a constant negative pressure in the superior vena cava which suggested that the peripheral veins were emptied by aspiration. The negative pressure has been attributed to both the dilating effect of inspiration on the great veins in the thorax (Burton-Ogita) and to the aspirating action of the heart (Glenn). Burton-Ogita found in the dog that the peripheral venous pressure falls during inspiration and rises during expiration and that opening the chest causes a great rise in pressure. In the human being, normal respiration does not effect venous pressures in the leg, but deep inspiration causes a lowering (Bedford and Wright, Selro, Fuchs, Hooker). On the other hand, both Ledderhose and Magnus found an increase in asphyxious pressure on deep inspiration. John Hunter suggested and, later, Osann observed that whenever veins were incised in a common sheath the arterial pulsations were transmitted to the vein with compression and elevation of venous pressure. Mayer has noted similar effect and has suggested that these changes in arterial volume are the cause of the progressive movement of venous blood, especially in the center of limbs and in bones where there is a more rigid envelope for the arterial impulse.

It is difficult to assume that either cardio-thoracic aspiration, or arterial pulsation are sufficient to return blood from the periphery at the normal rate (von Recklinghausen). William Harvey first described another force muscular

From the Varicose Vein Clinic, Division of Surgery, Northwestern University Medical School, and The Chicago Memorial Hospital.

compression, which is of tremendous importance. The anatomical arrangement of large intramuscular and subfacial deep veins surrounded by strong connective-tissue planes is a very efficient mechanism whereby the pressure of contracting muscles may compress and empty the venous plexus (Wood-Jones). The efficiency of this system depends on the integrity of the valves which prevent reflux of blood below the contracting muscle and from above during the period of relaxation (Jaeger). The valves also support the maximum force of contraction and of gravity so that these factors cannot act in a retrograde deleterious manner on the capillary function (Krogh). Loewenstein observed that the valves are remarkably capable of withstanding high pressure. He found that a tension as high as 500 mm mercury could be supported by normal saphenous valves before insufficiency developed.

The effect of exercise on the venous circulation has been studied by observing venous pressures during resting and active states. Von Recklinghausen, Hooker, and Beecher, Field, and Krogh measured the tension in the dorsal veins of the foot, and found the pressure in the upright position to be always less than the hydrostatic head. Hooker recorded the lowest readings during muscular activity of the leg (-21 cm water) and noted a slow rise toward 0 when the activity was stopped. If the subject reclined the pressure rose further to become a positive force of about 11 cm. Flexing the knee and thigh in either the horizontal or vertical position caused a fall in pressure. This is evidence that muscular activity together with the pump-like action of the joints upon neighboring veins is the driving force able to empty these vessels.

In the saphenous vein there is always a positive pressure which varies with muscular activity. In the resting erect subject the pressure approximated the hydrostatic head (Seiro). Moderate muscular activity of the leg may reduce the tension from 75 cm to 28 cm of water (Beecher). Violent exercise may raise the pressure due to the increase in intra-abdominal tension which acts as an obstruction to the venous return (Delbet).

Muscular compression acts directly on the deep veins with great effect and indirectly with less effect on the superficial vessels. Walking reduces the caliber of the superficial veins and the pressure within them by aspiration into the deep channels through the communicating vessels. Yet the flow through the entire leg is increased, which indicates that the deep circulation carries the greater load (90 per cent of the venous return, according to Magnus). If there were direct com-

munication up the vena cava, the maximum venous pressure during activity would be well above the hydrostatic head (gravity factor plus force of muscular compression). Actually the pressure is lower because the return of blood takes place in stages due to the segmental action of different groups of muscles along the course of the deep veins (Beecher, Field, and Krogh). In addition, the vein itself is divided into segments by the location and action of the valves.

Involuntary or static muscular compression is another factor in the process. The pressure in veins of the paralyzed or anesthetized limb (where the muscles are flaccid) rises to approximate the theoretical hydrostatic head (equal to the weight of the blood column extending from the foot to the heart). Thus, in the normal vertical inactive position there may be enough involuntary muscular compression of the veins to partially empty them but not enough to prevent some stasis, as evidenced by the discomfort which arises on standing still for long periods of time (Hooker).

Henderson *et al* have noted that the intrinsic muscle tone may be an important factor. This is effective in even resting muscles and may be increased by activity. Blood enters and distends the vessels within the muscle and, if tonus is present, part of the force is taken up by the elasticity of the tissue which pushes the blood on through the veins.

Physical exercise may act in still another way to empty these vessels. There are four venous plexuses in the sole of the foot over the bony prominences. These are exposed to weight bearing forces so that walking compresses and empties them (Spalteholz).

To summarize, the deep veins are emptied by a combination of forces which may include capillary pressure, cardiothoracic aspiration, compression by arterial pulsation, weight-bearing, muscle tonus, and the force of contracting muscles. The superficial vessels are affected by the flow from the capillaries, aspiration of the great veins, and weight-bearing. Muscular compression may help to empty the veins of the leg and thigh by decreasing their caliber but this is less effective than in the deep system because the force of compression is confined in part by the investing fascia. Also, the energy of compression is reduced because of the elastic support of the superficial veins. The force of contraction lasts for only one-third of the time necessary to take a step. During the remaining two-thirds of the time, when the muscles are relaxed, the pressure is lower in the deep veins than in the superficial,

so that the subcutaneous trunks are emptied by aspiration (Beecher)

THE PHYSIOLOGY OF VARICOSE VEINS

The superficial veins of the leg are particularly subject to dilatation and stretching. Some factor seems to weaken the vessel wall or interfere with the valvular system or affect both. Because the superficial veins are supported by only weak connective tissue, they are more likely to become varicose. This factor is of major importance in the frequent involvement of the saphena magna because of its great length and consequent high internal pressure (Shimonek). Delbet states that 98 per cent of the varicosities are those of the long saphenous.

It is accepted that a varicosity starts to develop when the valves become either absolutely incompetent through disease or secondarily incompetent from weakening and dilatation of the vessel wall (Trendelenburg). Trendelenburg's classic work emphasized the extreme importance of the valves in varix formation. Incompetent valves may be present without varicose dilatation (Delbet) though the converse is not true because any appreciable increase in caliber of the vein would separate the cusps and allow reflux. Edwards in a study of the saphenous valves observed that the part of the cusp in contact with its fellow measured from 3 to 5 of the internal diameter of the vein. This means that if a vein dilates from 1.4 to 3 times its original size the valves will become incompetent.

Valvular failure usually involves the saphenous system, though occasionally one or more communicating veins may be affected. Incompetent communicating veins are either congenital in origin or the result of destruction of their valves by inflammation. Usually saphenous dilatation is noted when they are present (Chevier). It is thought that failure of the saphenous valves most often begins at the saphenofemoral junction and progresses downward as the vein dilates. Varicosities, however, are apt to appear first below the knee where the vein has the least support and where there is high internal pressure (Delbet, McPheeters, Merkert and Lundblad Seiro Adams).

Incompetence, dilatation, elongation, and tortuosity markedly affect the circulation in the involved vessel and the tissues drained by the system. There is much controversy concerning these changes so that it seems advisable to discuss each factor separately.

1. *Stasis and reversal of flow* Non-functioning valves together with an increase in caliber and

tortuosity slow the return of venous blood. Stagnation is especially marked when the patient is in the erect position. As the condition progresses, there may be an actual reversal of the direction of flow. Over one hundred years ago Lee presented evidence that loss of competency of the valves was followed by reflux. Water was introduced into a varicose saphenous vein at its junction with the femoral in a man recently dead of cholera. The fluid immediately dilated the trunk and all the branches. Examination of the vein revealed healthy appearing valves, but they were insufficient to close the lumen. Magnus more recently made a similar observation on an amputated leg with varicosities (removed because of a malignant tumor). The same experiment on the normal veins of cadavers failed to produce reflux.

The first adequate description of the pathological anatomy and physiology of varicose veins was made by Trendelenburg. He observed that degenerative changes occurred in the valves and walls of these vessels, and that when incompetence was present coughing or straining produced an impulse in the varix. When such a limb was changed from the horizontal to the erect position, blood flowed from above downward because of the effect of gravity. This observation is the basis of the Trendelenburg test for venous reflux. Such a clear demonstration of the reversal of the circulation led him to advise ligation of the vein in order to prevent reflux and decrease the pressure.

McPheeters and his coworkers have made extensive studies on the direction of flow by injecting radiopaque media into varicose veins and observing the speed and direction of dissemination under the fluoroscope. They concluded that in early cases of varicose veins with a negative Trendelenburg test, there is no reversal of flow but only stagnation. In the case giving a positive reaction to the Trendelenburg test, the flow is reversed even when walking. Exercise caused the material to pass into the deep system where it advanced toward the heart with each pump-like action of the leg.

Recent work has been introduced which indicates that reflux may be only a transitory change in circulation which occurs on assumption of the erect position. Loehr and Toelle, by similar x-ray studies, found in a subject with positive Trendelenburg test, that reversal of flow occurred on assumption of the erect position however after the individual stood a while the circulation reversed and flowed toward the heart, which indicated that the so-called vicious cycle or reflux from the femoral vein was only a transitory phenomenon. Further proof was shown in a case

of diabetic gangrene prior to amputation. The femoral vein was isolated in the thigh, and, under the fluoroscope, a contrast medium was injected. Reverse flow into the saphenous was not noted. Warwick (quoted by Robb) observed, with the x-rays, first a downward rush of blood until equilibrium was reached and then reversal to the normal direction. The rate of return was much slower than normal. Work and increased abdominal pressure readily caused the slow central flow to reverse toward the periphery.

Schmier found no reversal of flow with valvular insufficiency. He used an opaque substance of nearly the same specific gravity as blood. With the subject standing quietly the flow was directed toward the heart. Deep expiration and straining made the media flow peripherally. Both Schmier and Loehr and Toelle believe that the descent of opaque media in incompetent veins, as observed by others, was due to the use of too heavy a contrast material so that it sank in spite of the slow central flow of blood.

It would seem, therefore, that usually in the incompetent vein in the horizontal position blood moves toward the heart without difficulty. On assumption of the upright position, there may be a sudden reversal of flow due to gravity. Then as the subject walks and as the venules distend with blood from the capillaries there may be a slow change in circulation so that the central direction of flow is re-established, but at a slower rate than normal. Because the efficiency of the valvular mechanism is impaired, changes induced in the intra-abdominal pressure by coughing or straining readily force the blood backward down the venous tree.

2 Increased venous pressure. It is generally known that the pressure is higher than normal in veins with incompetent valves. Delbet found normal saphenous pressures of about 60 mm. of mercury during mild muscular activity and 160 mm. during excessive exercise. In the incompetent vessel the pressure rose as high as 260 mm. with violent exercise, because the increase in intra-abdominal tension was transmitted downward without hindrance.

McPheeters, Merkert, and Lundblad made similar studies and found that in the prone position the pressure in the incompetent saphenous was about 12.5 mm. of mercury. In the standing position the tension rose to 42.7 mm., and straining caused an increase to 88 mm. Adams has recently verified these findings, noting even greater elevations in pressure. Deep expirations may raise the pressure in these veins (Seiro). These sudden increases in tension are eliminated

by high saphenous ligation (Schmier, Adams). This procedure, however, does not reduce the sustained high pressure in the vein (De Takats, Veal and Van Werden, Adams).

Activity of the muscles of the leg lowers the tension, the extent of the decrease depends on the degree of valvular incompetency of the saphenous vein. Incompetence of the communicating vein, however (either congenital in origin or produced by a destructive inflammatory process), should further increase the pressure and trauma in the superficial veins by subjecting them to an increased tension from reflux during muscular activity.

Beecher observed that the normal saphenous pressure may vary from 28 to 40 cm. of water and depends on the amount of muscular activity of the leg. In the incompetent saphenous varix the tension is persistently and unvaryingly high, approximating the hydrostatic head. Any change in intra-abdominal pressure is immediately transmitted down the vessel to produce a sudden surge in tension, it is this factor which, many believe, is so important in the progress of the disease.

The increase in pressure involves not only the larger vessels, even the capillaries may be congested by these changes. There may be telangiectases, purpuric lesions, and pigmentation associated with increased capillary pressure and permeability (Cortella).

3 Changes in blood elements. The unquestionable slowing and eddying of the blood in varicosities, together with the surges of increased pressure and resultant trauma, produce certain effects on the blood in varicosities and the tissues drained by the saphenous system.

Complete analyses of the blood taken from uncomplicated varicosities show that there are normal amounts of erythrocytes, leukocytes, and platelets. Coagulation time, erythrocyte fragility, and hydrogen-ion concentration are within normal limits. Stasis, however, leads to increased cell permeability, loss of fluid, and concentration of blood as shown by increased viscosity and elevation of the refractometric index. There is an increased sedimentation rate probably because of the increased fibrin content (Erb and Tiefensee). No change occurs in the albumin-globulin ratio. If the concentration of blood was very great, it seems logical to assume that the blood count would be elevated. No explanation is given for this paradox.

Blood-chemistry studies indicate that there is no change in the blood-sugar or calcium content (Schaefer, Wildegans, Colombo). Klapp ob-

served higher than normal amounts of non-protein nitrogen in 30 of 40 patients with varicose veins after they had stood for one hour. Schaefer found considerable variation in non-protein nitrogen determinations, some being higher than normal. Erb and Tiefensee obtained only values within normal limits although slight differences were noticed in cases of ulcer. There is still considerable difference in opinion regarding oxygen and carbon-dioxide content. Magnus and, later, Klapp state that reflux is responsible for a high carbon-dioxide concentration. Schaefer found considerable variation in his determinations, and Erb and Tiefensee found the concentration to be at the upper limits of the normal range. De Takats *et al* obtained higher carbon-dioxide concentrations in varicose veins than in cubital veins of the same individual. They also found the oxygen content to be lower than normal. Blalock, the same year, obtained similar results in cases of uncomplicated varicosities, but found that when ulceration and infection were present the oxygen content was higher than in similarly placed normal veins of the opposite extremity. Also the oxygen content in cases of unilateral varicosity was higher in the femoral vein of the diseased side. This suggests that the total flow of blood through the leg of a person with varicosities is increased. Blalock criticizes De Takats work because a comparison was made between blood samples drawn from the elbow and the leg. There is considerable variation in the gaseous content of blood in different portions of the venous tree. Also the oxygen content varies with position, being highest with the subject recumbent and lowest when he is upright (hydrostatic effect). Holling, Beecher and Linton found the same oxygen tension in normal blood and that drawn from varicose veins.

4. *Edema formation.* The movement of fluid across the capillary wall is mainly the resultant of two opposing forces. The colloid osmotic pressure of the plasma tends to draw fluid into the vessel, while the hydrostatic pressure tends to force it out. This balance may be affected by capillary permeability, tissue elasticity and lymph flow (Starling).

Although there is a persistently high pressure in the incompetent vein, gross edema is rarely present. The venous tension may be more than twice the normal osmotic pressure of blood which equals 40 cm. of water and therefore should produce a significant transudate. Frey found that latent edema was very rare in uncomplicated cases, and when it did occur it was not directly proportional to the severity of the varicose state.

Holling, Beecher and Linton measured the amount of swelling of the leg when a subject moved from bed into the sitting position. They found a barely significant increase in the formation of fluid above normal in uncomplicated cases and those complicated with ulcers. There was, however, a definite increase in those subjects having incompetent communicating veins.

The increased colloid osmotic pressure in varicose veins is probably of little effect in preventing the passage of fluid out of the capillaries (Beecher). In fact, venous pressures exceeding 60 mm. of mercury cause the escape of protein from the blood vessel. At 80 mm. the capillary filtrate may contain 15 per cent of protein which would further facilitate the loss of fluid (Landis, Jona, Angevine and Erb).

The absence of edema must mean that the deep veins are perfectly able to assume the function of the superficial vessels. The reciprocal action of the deep system is indicated by the lack of edema following the obliteration of extensive varicosities.

ORIGIN OF THE COMPLICATIONS OF VARICOSE VEINS

We find then that in the normal saphenous vein the pressure varies with the degree of muscular activity of the limb and is only moderately affected by increased intra-abdominal tension. In the incompetent vein there is stasis, concentration of blood, and a sustained high pressure (equivalent to the hydrostatic head) which is unaffected by muscular activity. Increased intra-abdominal tension immediately elevates the pressure within the saphenous system to abnormal heights. Actual reversal of flow may occur and some writers believe that there may be an increased concentration of carbon-dioxide and a decrease in oxygen. The presence of edema is rare because the deep veins are capable of taking over the physiological role of the superficial vessels. Marked edema does appear when there is some impairment of the deeper circulation, as in a deep thrombophlebitis or obstruction to the return flow from a tumor. It may also appear with an insufficiency of a communicating vein. The transudate due to inflammation and obstruction may be present only temporarily and disappear with the development of collateral circulation (often through the superficial veins) or with the recanalization of the occluding thrombus. On the other hand, if a large portion of the deep system has been obliterated or the inflammatory process has destroyed the valves, the edema is apt to be permanent. This indicates that edema appears only after a major disturbance of the venous return of the leg.

and that in ordinary saphenous varicosities edema is not noted because of the reciprocal action of the two systems of veins. Blalock's observation that the flow in the deep veins seems to be increased in varicose states may have some bearing on this.

Because of the pathological physiology in the varicosity, inflammatory processes are apt to occur. These may be latent or gross lesions which tend to extend beyond the adventitia of the vein and involve surrounding structures, particularly the overlying skin. Whether this inflammatory change, or the presence of edema fluid in the tissues is the cause of the indurations, eczemas, and ulcers is open to discussion. These changes are found most often in the middle or lower third of the leg, which seems contrary to the physiological factors of edema formation. Transudate must occur in the capillary bed and therefore the foot should be the site of swelling and seat of the complication. In addition, the varicose complications are usually located over venous trunks or networks as circumscribed discrete entities, and are not diffuse as one would expect if the exciting factor were edema and malnutrition, which would involve the whole area drained by the venous tree (Zimmerman).

On the other hand, all these lesions respond to measures which decrease stasis and increase the efficiency of the venous circulation of the leg, such as bed rest and supportive dressings (Unna's boots and elastic adhesive bandages). Even the stubborn chronic ulceration which may follow a deep vein thrombophlebitis or occur over an incompetent communicating vein will heal, though slowly, with this type of treatment.

Perhaps phlebitic inflammation is the primary agent which produces changes in the capillary circulation of the skin so that exudation occurs—cellular as well as fluid. Loss of erythrocytes and hemolysis would lead to skin pigmentation, and fluid transudate of this type, together with the fibrosis of chronic inflammation, could produce local skin malnutrition. Such a sequence of events might easily be responsible for the clinical observations noted.

It is hoped that this paper has focused attention on certain discrepancies and differences concerning the physiology and pathology of varicose veins, and that research will be stimulated.

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SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Veal, J. R.: Thrombosis of the Axillary and Subclavian Veins, with Note on the Post Thrombotic Syndrome. *Am J M Sc* 940, 300 '37

The author reviews the syndrome of thrombosis of the axillary and subclavian veins. Acute thrombosis of these veins produces a typical syndrome, regardless of the cause of the thrombosis. The cardinal symptoms are pain in the arm and shoulder, massive pitting edema of the entire extremity, coldness and partial loss of function of the arm, preservation of the radial pulse, elevation of the systolic pressure on the affected side, palpable, tender cord-like swelling along the course of the brachial, basilic, and axillary veins, marked elevation of the local venous pressure, and decrease in the oxygen content of the venous blood of the affected arm.

A classification and examples of the various types of thrombosis are presented. Clinical studies of 7 cases are recorded. There are several forms of thrombosis of the axillary and subclavian veins. Although some of the causative factors have not been definitely established in these several forms, the following classification seems complete enough for practical purposes.

1. Primary thrombosis
 - (a) Thrombophlebitis (Bacterial)
 - (b) Phlebothrombosis (Non-bacterial, traumatic or effort thrombosis)
2. Secondary thrombosis
 - (a) Thrombophlebitis from regional infection
 - (b) Thrombosis from malignancies of the axilla and chest
3. Post thrombotic syndrome

The frequency of secondary thrombosis from malignancies of the chest and axilla is emphasized. From a study of approximately 60 cases of post operative edema of the arm (following radical mastectomy for carcinoma of the breast) it was found that the cause of the edema was an obstruction of the venous return from the arm in about 90 per cent of the cases. In some the obstruction was the result of scar formation; in others, of direct involvement of the axillary or subclavian vein by the carcinoma.

Regardless of the type of thrombosis, the development of collateral circulation, after occlusion of the axillary and subclavian veins, follows a more or less definite course which depends primarily upon the extent of the thrombosis. When it does not extend beyond the axillary vein the development of the collaterals is rapid. However, when the thrombosis is more widespread, the collaterals develop more slowly. In the cases of secondary thrombosis following radical amputation of the breast, there is less chance for the development of adequate collaterals.

Because of the nature of the operation, the axillo-thoracic, often the long thoracic, and sometimes the cephalic veins have been sacrificed. Furthermore, attempts at collateral formation are frustrated because of the formation of scar tissue through which the new veins must grow.

Experiments made on a selected group of cases show that the residual symptoms that follow occlusion of the axillary and subclavian veins are due to the abnormal venous pressure. The severity of these symptoms depends upon the extent of the development of the collateral circulation. In some cases, the collateral venous channels may become adequate to take care of the return blood, and there will be no residual symptoms. In others, there may be enough channels to care for the venous flow during rest, but they may not be capable of coping with the increase in flow which follows exercise. In these, exercise causes an increase in the local venous pressure, retardation of flow and lowering of the oxygen content. In still another group, even during rest, the venous pressure may be sufficiently high to cause persistent edema. In these exercise of course, elevates the pressure to an even higher level and causes a increase in the edema.

A résumé of treatment for the various forms of thrombosis is outlined. There are no known surgical measures that will completely relieve thrombosis of the axillary and subclavian veins. When the thrombosis is extensive and there is an extreme degree of edema, multiple skin punctures may prove very helpful. Thrombophlebitis and phlebothrombosis of the axillary and subclavian veins are best treated by complete rest, elevation of the extremity on soft pillows, and the local application of heat. This should continue until there is obvious development of collaterals. In practically all cases the edema will disappear within a few days to several weeks.

HERBERT F. THURGOOD, M.D.

BLOOD TRANSFUSION

Solandt, D. Y. and Best, C. H.: Time-Relations of Heparin Action on Blood-Clotting and Platelet Agglutination. *Lancet*, 940, 38 '34

From the practical standpoint, heparin develops its characteristic effect on blood-clotting time with little delay. However, a single dose of heparin, sufficient to raise the clotting time of the blood of anesthetized dogs to more than 40 hours, does not prevent the agglutination of platelets, in the presence of what appears to be maximal stimulus.

With larger doses of heparin, the effect on platelet agglutination is such that on the clotting time may not become obvious until from fifteen to fifty minutes after the injection.

It is the presence of what appears to be maximal stimulus, as done of heparin in excess of 300 units per

kgm of body weight is necessary to prevent agglutination. Thrombosis in the veins, arteries, and on the cardiac endothelium can be completely prevented by much smaller doses of heparin. This indicates that extreme damage does not produce a maximal stimulus to platelet agglutination.

In view of the absence of effect on agglutination of doses of heparin which produce a clotting time of more than six hours, it is noteworthy that, after a large dose has been administered, platelet agglutination will not start again until after the clotting time of the blood has returned to less than one hour. In spite of this, the sudden removal of heparin by protamine leads to the immediate onset of platelet agglutination. These findings suggest that, in the presence of a little heparin, an effect on agglutination previously produced by a higher concentration may persist.

SAMUEL KAHN, M D

Kark, R., and Souter, A. W. Synthetic Vitamin K in the Treatment of Hypoprothrombinemia. *Lancet*, 1940, 238, 1140.

The author gives an excellent review of the literature. "A group of 18 patients with hypoprothrombinemia were treated parenterally with a water-soluble derivative of 2-methyl 1,4 naphthoquinone (synthetic vitamin K). In 9 of these the lowered blood-prothrombin concentration was rapidly restored to a normal level by the administration of 1-6 c cm of a solution of the material, equivalent to 16 mg of 2-methyl 1,4-naphthoquinone. In 3 patients with hemorrhage resulting from the lowered blood prothrombin levels the bleeding was satisfactorily controlled within a few hours of intravenous or intramuscular administration of the material. On the other hand, 12 patients with hypoprothrombinemia associated with parenchymatous hepatic disease did not respond to intensive parenteral administration of either water soluble synthetic vitamin K or natural vitamin K obtained from alfalfa, supplemented in some instances by large doses of 2-methyl 1,4 naphthoquinone and whole liver by mouth. It is suggested that this failure of response may have prognostic importance when considered along with the level at which the blood prothrombin concentration is maintained in these patients."

Of the 12 patients that did not respond, 6 died without any improvement in the prothrombin time while 6 survived with very low prothrombin levels. The authors caution, "The administration of therapeutic doses of vitamin K or its analogues before operation is not in itself a guarantee that the blood prothrombin concentration will be raised to within normal limits. In some patients with liver disease this is not accomplished."

PAUL STARR, M D

Marriott, H. L., and Kekwick, A. Volume and Rate of Blood Transfusion for the Relief of Anemia. *Brit M J*, 1940, 1, 1043.

Marriott and Kekwick report the use of massive blood transfusions in 194 cases, the amount of blood given being calculated to raise the hemoglobin to

the desired level. The amount of blood required for every 10 per cent increase of hemoglobin in the average adult is about a pint. These transfusions were given slowly so that the blood volume of the recipients was increased only by the added cell volume. It is believed that if an increase of more than 33 per cent is desired, the transfusion should be done in two stages with an interval of two days between. Such transfusions are recommended in dangerously severe anemias, anemias complicated by some emergency, anemias in which recovery is urgent, aplastic and allied anemic states, and in anemias accompanying septic and infective conditions.

The average quantity of blood given to 177 adults was 2,039 c cm. Few of the patients developed signs of cardiac failure. The time used was twenty seven and one-tenth hours with an average rate of 84 c cm of blood per hour. Five patients had some dyspnea and 1 died with pulmonary edema. The most severe reactions occurred in those cases in which the rate of administration exceeded 100 c cm per hour. One cubic centimeter per pound of body weight per hour is regarded as the most rapid rate at which blood can be given safely, if a cardiac or respiratory disease is present this amount should be cut in half.

THOMAS C DOUGLASS, M D

Edwards, F. R., and Davie, T. B. Preserved Blood—An Analysis of Its Use. *Brit M J*, 1940, 2, 73.

The authors studied the results obtained from 1,500 bottles of blood distributed by the Meyerside War Blood Bank in Liverpool. The blood was preserved in 3.8 per cent sodium citrate in 450 c cm bottles which could be easily transported in insulated boxes from several depots.

About 9 per cent of the blood was wasted. The average age of the blood was seven days. The reactions following the use of this preserved blood were no more frequent than those following a series of 100 transfusions of fresh blood. The highest percentage of reactions occurred in patients with acute septic conditions. The reactions increased with the age of the blood.

Deaths which occurred within twelve hours following the transfusion were believed to be due to the underlying pathology.

The various conditions favorably affected were mentioned. Fresh blood is believed to be preferable in jaundice and acute septic conditions. The benefits of blood plasma are mentioned briefly.

THOMAS C DOUGLASS, M D

Owada, K. Experimental Studies on the Changes of Protein, Carbohydrate, and Blood Gas in Stored Blood. Studies on Normal, Acid, Alkaloid, Cholemic, and Uremic Blood (Experimentelle Studien ueber die Veraenderungen des Eiweisses, Kohlehydrates und Blutgases im konservierten Blut. Versuch am normalen, azidotischen, alkalotischen, cholaemischen, und uremischen Blut). *Tohoku J Exper Med*, 1940, 38, 242, 262.

On account of the increasing use of stored blood in military and civil practice, Owada studied the

cha gas in oxygen consumption of the erythrocytes, protein concentration of the serum, colloid osmotic pressure, sodium-chloride content of the serum, and in glycolysis of normal, acid, and alkalioid defibrinated rabbit blood after storage of four, six, eight and ten days.

The oxygen capacity was determined with Barcroft differential blood gas apparatus, the blood sugar by Hagedorn and Jensen's method, the lactic acid by a method of Ina Hiro Hayasaka Anrep, and Cannon. The serum protein was determined by means of Pulfrich immersion refractometer; the colloid osmotic pressure by Krogh and Nakazawa method, and the sodium chloride by the method of Rusznyak.

In normal blood saturated with oxygen the erythrocytes consumed about one-fifth of the original oxygen content. The oxygen capacity of the blood diminished slightly but the serum protein, colloid osmotic pressure, and sodium chloride remained constant. There was also marked glycolysis, with reduction of the blood sugar to about one-third of the original value, and an increase of the lactic acid.

In acid blood the erythrocytes consumed less oxygen than in normal blood, and the diminution of oxygen capacity was greater. There was reduction of the serum protein and the colloid osmotic pressure and the reduction of the colloid osmotic pressure was more than would correspond to the reduction of protein content. There was also a reduction of the sodium chloride content in the serum. Glycolysis was slower than in normal blood, but the increase in lactic acid was greater.

In alkalioid blood there was reduction of the oxygen consumption of the erythrocytes in comparison with that of normal blood, while the reduction of the oxygen capacity was about the same. The serum protein remained constant, but the colloid osmotic pressure fell slightly. There was reduction of sodium chloride in the serum. Glycolysis equaled that in normal blood while the increase in lactic acid was less.

Experimental liver damage was produced in a group of rabbits by injections of $\frac{1}{4}$ per cent solution of phosphorus olive oil in amounts of 0.5 cm. per kgm. of body weight once daily for ten days. Oxygen consumption of the red blood cells and reduction of the oxygen capacity were in normal blood. There were slightly lower initial values of the blood sugar and lactic acid of the blood. The behavior of the blood sugar during storage was about the same as that of normal blood, while the lactic acid formation was distinctly higher. There was reduction of the serum protein and of the colloid osmotic pressure, but the latter reduction was proportionally greater. There was slight reduction of the sodium chloride in the serum.

In another group of rabbits 0.5 cm. of chloroform per kgm. of body weight was given subcutaneously on two successive days. The oxygen consumption and reduction of the oxygen capacity were the same in normal or in phosphorus-

cholemic blood. The initial blood sugar was about normal, the initial lactic-acid level higher. The glycolysis was greater than in normal blood, while the lactic-acid increase was about the same as in normal blood. The protein value remained about constant, but the osmotic pressure fell. As in the cases of phosphorus poisoning there was slight reduction of the sodium-chloride level.

Cholelithiasis as created in another group of rabbits by ligation of the common bile duct. Forty-eight hours after the intervention icteric signs developed, and blood was taken for storage at this time. Definite diminution of the oxygen consumption of the erythrocytes was found, and the reduction of the oxygen capacity was increased. Glycolysis was distinctly diminished after the cholelithiasis ligation. The serum protein, colloid osmotic pressure and sodium chloride underwent a slight reduction during storage.

In a study of uremic blood, a group of 5 rabbits received one subcutaneous injection of 0.5 ccm. per kgm. of weight of a 5 per cent solution of urea nitrate. Blood was taken forty-eight hours after this injection. The oxygen consumption of the red cells was found to be considerably less than in normal blood, while the change of oxygen capacity was about the same as that of normal blood. Glycolysis and lactic-acid formation were slightly greater than in normal blood. The serum protein, colloid osmotic pressure and proportion of colloid osmotic pressure to the protein content were initially greater than normal, and during storage all of them fell considerably. There was a slight fall of sodium chloride in the serum during storage.

Another group of rabbits was given 1.0 doses of 0.5 ccm. per kgm. of body weight of a 0.1 per cent solution of cantharidine-acetic acid either twenty-four hours apart. Blood was taken twenty-four hours after the second injection. The oxygen consumption of the erythrocytes was greatly diminished, but the diminution of the oxygen capacity was normal. The blood sugar and lactic acid changes were about normal. The serum protein, sodium chloride, colloid osmotic pressure and proportion of osmotic pressure to the protein content fell.

In another group of 5 rabbits bilateral ligation of the ureters as done. Blood was taken forty-eight hours after operation. There was great reduction of oxygen consumption and the oxygen capacity was diminished definitely more than in normal blood. The initial blood-sugar level was high and the lactic acid level low; the changes during storage were about normal. The serum protein, colloid osmotic pressure, proportion of colloid osmotic pressure to protein content, and sodium chloride in the serum showed about the same decrease as in the preceding series.

Bilateral nephrectomy as done in a group of 5 rabbits and blood was taken twenty-four hours thereafter. The oxygen values were similar to those in the preceding series. Glycolysis and the formation of lactic acid were about as in normal blood. The initial values of protein and osmotic pressure were

slightly higher, and the proportion of osmotic pressure to protein content was slightly lower than normal. The protein level fell slightly during storage, while the osmotic pressure and the osmotic pressure per per cent protein fell considerably in the first half of the storage period, but rose in the second half, however, they did not return to the initial values. The sodium-chloride levels paralleled the protein levels.

HEINRICH LAMM, M D

Hill, J M, and Pfeiffer, D C. A New and Economical Desiccating Process Particularly Suitable for the Preparation of Concentrated Plasma or Serum for Intravenous Use. The Adtevac Process. *Ann Int Med*, 1940, 14 201

The authors point out that a practical and inexpensive desiccation process which removes storage difficulties, prevents bacterial growth, and preserves biological properties is vital if the use of plasma and ordinary or convalescent serum is to become widespread. Safe and indefinitely long storage of whole plasma, possible in the dehydrated state, should make practicable the extensive use of the plasma treatment of shock in war time.

When the dried plasma is dissolved in distilled water any desired concentration from four times the normal to more dilute than normal can be made as desired. A new and improved process for the desiccation of plasma, serum, and biological substances employed at Baylor University Hospital in connection with a blood bank is reported. The Adtevac process accomplishes desiccation from the frozen state by means of a vacuum and the removal of water vapor by controlled adsorption. Its chief advantage is economy of operation. The thermodynamics of this type of desiccation are considered and discussed.

The blood bank is an ideal source of an adequate supply of plasma. Donors are required to give enough blood to replace the amount of plasma used. Blood given for the purpose of replacing plasma is

usually kept in the blood bank up to a maximum of ten days. For current use desiccated plasma is redissolved in pyrogen-free water to make a concentration four times the normal, placed in Erlenmeyer flasks, and kept frozen at -18°C . For use this plasma is melted in a 37.5°C water-bath and given with a large (100 c cm) syringe.

A preliminary report of clinical results in a variety of conditions is given. Concentrated plasma was used to replenish deficiencies in blood protein, to build up or sustain blood volume, for its hypertonic effect in reducing edema, and in a miscellaneous group of cases. No febrile or other harmful reactions were noted in 66 successive instances of intravenous administration of concentrated plasma to 45 patients.

WALTER H NADLER, M D

Brennan, H J. Plasma Transfusions in the Treatment of Hemorrhage. *Brit M J*, 1940, 1 1047

This author believes red blood cells increase in size after hemorrhage and probably become side tracked within muscle capillaries which results in a loss of cells internally in addition to the loss from hemorrhage. These cells may be made available by the introduction into the circulation of 500 c cm of blood plasma.

To support this contention, 16 cases are reported briefly in which the red blood-cell count rose and the mean corpuscular volume fell following plasma infusions. The mechanics of this effect are believed to be due to the higher osmotic pressure of the infused plasma, which in turn is caused by the potassium shift to the plasma in the stored blood. This increased pressure causes the drawing of fluid from the swollen red blood cells.

Because of the ready availability of blood plasma, its ease of storage, and the saving of time, as the patient does not require typing, the transfusion of plasma should become a routine measure for the treatment of severe hemorrhage, especially in military surgery.

THOMAS C DOUGLASS, M D

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE POSTOPERATIVE TREATMENT

Gardner G. H. Pre-Operative and Postoperative Management: Gynecology Arch. Surg. 9:20, 4, 64

A careful history is essential for proper pre-operative care. Every patient should be subjected to complete physical examination including blood count, urine examination, and Kahn test. Most patients with myocardial damage can safely be subjected to major gynecological procedures provided the heart is well compensated. Patients with nephritis are dubious surgical risks. Anemic women are more likely to have postoperative complications than those who have normal blood counts. Repeated transfusions are used. The author prefers not to operate until the red blood-cell count is over 4,000,000 and the hemoglobin is at least 1 gm. Diabetes, which can be controlled, is not a contraindication to surgical intervention. Age alone is not a contraindication to gynecological surgery.

Preparation for operation includes thorough washing of the abdomen and vulva with soap and water and careful shaving of these areas. A cleansing tap water enema is given late in the afternoon of the day before operation. A high carbohydrate liquid diet is preferred for the evening meal before operation. A good night's sleep is secured by the administration of hypnosis, usually one of the barbiturates. The usual anesthetic is ethylene, supplemented by a small amount of ether if necessary.

A few essential principles are emphasized: (1) masking of both the nose and the mouth strictly to prevent to asphyxia gentleness in handling tissues to complete hemostasis (2) avoidance of mass ligatures (3) abstinence from the use of plain catgut and the employment of silk or the smallest caliber chronic sutures that are practical (4) use of rubber packs (5) use of the abdomen (6) avoidance of the use of gauze packs against small intestinal surfaces and finally promptness in operating with minimum of trauma. The routine use of stay sutures is unnecessary and may be harmful. The promiscuous use of drains is ill advised.

After both abdominal and vaginal operations the head of the bed is elevated 6 in., or 5 cm. as soon as the patient has regained consciousness. Ventilation with 5 per cent carbon dioxide and 95 per cent oxygen on three or four occasions during the first fifteen hours after major operations seems to reduce the incidence of pulmonary complications.

After abdominal operations the patient is given 1,000 c.c.m. of 5 per cent dextrose in physiological solution of sodium chloride immediately six to eight hours being consumed in its administration. After certain major abdominal procedures, it is advisable to give from 1,000 to 500 c.c.m. of fluid as soon as

nausea and vomiting have disappeared, fluid is allowed orally. Solid food is allowed as soon as the patient wishes it.

Patient are catheterized as often and as long as necessary. Patients receiving intravenous fluid are catheterized when 1,500 c.c.m. has been administered after administration of this amount of fluid there are usually about 300 c.c.m. of urine in the bladder.

Even after major operations, patients may be allowed out of bed soon as they succeed in urinating when permitted to use a commode. After most abdominal operations, spontaneous urination starts on the second or third day.

The author believes that it is very important to prevent overdistention. Residual urine, which remains after incomplete emptying of the bladder, is an important factor in the production of inflammation of the urinary tract. Consequently the second important step is to prevent the accumulation of residual urine. The patient should be catheterized after voiding until the residual urine amount is less than 5 c.c.m. on two successive days.

Rapid improvement in infections of the lower part of the urinary tract follows the administration of sulfanilamide e.g. from 1 g. (15 to 20 g.) of the drug four times daily.

During the first forty-eight hours after operation hypodermic injections of morphine sulfate, codeine sulfate, pantopon, or dilaudid are employed as often as is necessary for comfort.

If vomiting continues after twenty-four hours or if distention of the upper part of the abdomen is recognized during the early postoperative days, there is no therapy which equals the use of a Levine tube with continuous suction to keep the stomach empty. When continuous gastric suction is being employed, fluid balance and blood chemistry balance must be maintained by the intravenous administration of fluids.

Many patients are bothered by mild gas pains on the second, third, and fourth day after abdominal operations. Within seventy-two hours after an abdominal operation decided relief from these pains is to be expected. Rectal tube aids in elimination of flatus. Dry heat to the abdomen is also advised.

Laced corsets of adhesive tape are used routinely after abdominal operations. They allow regulation of the amount of tension on the dressings. Abdominal cutaneous incisions are approximated with silver clips. These clips are loosened after forty-eight hours and removed after ninety-six hours. The abdominal incision is then splinted by many "butterfly" strips of adhesive tape. Patients wear their corsets for approximately three weeks after operation and remove them at home. Special surgical garments are not recommended after routine abdominal operations.

The patients' comfort is the chief indication for an increase in their activities. They may be out of bed as soon as they desire, as a rule this may be in six or seven days after operation. If a patient has an unexplained fever she is kept in bed. With this routine most patients subjected to laparotomy leave the hospital in ten or twelve days.

Unfavorable signs and symptoms in the post-operative period are undue rise of temperature, fever protracted beyond the fifth day, rapid pulse, continued vomiting, abdominal distention, and severe or protracted pain. Shock is rarely encountered. The best treatment is its avoidance. The usual measures for combating shock are application of external heat, elevation of the foot of the bed, intravenous administration of dextrose, and transfusion of citrated blood, in addition the patient must have an adequate supply of oxygen.

Generalized peritonitis is one of the more frequent causes of death after gynecological operations. Its presence is to be suspected in a patient with high fever and a pulse which is rapid, thready, and out of proportion to the febrile response, the leucocyte count may be high in favorable cases and low in patients with a poor prognosis, the tongue is dry, the facies is hippocratic, vomiting, abdominal distention, and ileus are present.

Patients are urged to move about early in their convalescence and are encouraged to be out of bed by the fifth, sixth, or seventh day in order to combat phlebitis. As a prophylactic measure against phlebitis large doses of thyroid may be given to women in whom postoperative phlebitis may be anticipated.

Pulmonary embolism is the tragedy of pelvic surgery, while femoral thrombophlebitis is one of the most annoying complications seen. It usually attacks a patient with previously unexplained fever during the third postoperative week. It is said that femoral thrombophlebitis is rarely complicated by pulmonary embolism, emboli usually arise from cryptic pelvic thrombophlebitis. Therapeutic measures are rest in bed, elevation of the leg, application of cotton around the leg, and employment of dry heat. Irradiation seems to shorten the course of the disease.

Ileus after gynecological operations usually results from peritonitis. Rarely is it of the adynamic type for which pitressin is helpful. Intestinal obstruction is an infrequent complication.

DANIEL G. MORTON, M.D.

Selye, H., and Dosne, C. **The Treatment of Wound Shock with Corticosterone** *Lancet*, 1940, 239-70.

Experiments in the rat indicate that pure corticosterone administered in aqueous solution is very effective in combating shock caused by surgical trauma and other means. Desoxycorticosterone is ineffective when tested under similar conditions. It appears that a hydroxyl group is important for the shock-combating action of corticosteroids. The relative inefficiency of adrenocortical extracts is probably due to the presence of harmful contaminat-

ing substances which counterbalance the beneficial effects of the cortical sterone and possibly of other active steroids contained in them. In view of the limited amount of adrenal glands which could be made available for use in the extraction of active steroids, other possible sources of supply have been sought.

Preliminary experiments indicate the presence of relatively great adrenocortical activity in the urine of large domestic animals. There were found 11 rat units per liter in the urine of a one-year-old heifer and 20 units per liter in the urine of each of 2 cows during the early stages of pregnancy. The largest amount, 40 units per liter, was found in a pooled urine specimen from 3 mares belonging to a riding school. This amount corresponds approximately to the amount extractable from 90 gm of cattle adrenal glands. It is possible that the muscular exercise performed by these animals helps to increase their production of adrenocortical hormone, since it is known that muscular work is very effective in eliciting the alarm reaction including increased cortical activity. Another source of supply of cortical hormone would be the synthesis of corticosterone. Up to the present time such a synthetic compound is not available.

MANUEL L. LICHTENSTEIN, M.D.

Browder, J., and Bragdon, F. H. **An Evaluation of Sorbitol as a Dehydrating Agent** *Am J Surg*, 1940, 49-234.

A total of 50 intravenous injections of sorbitol was given to 38 patients with a variety of intracranial lesions. Clinical improvement as evidenced by a more lucid state of consciousness and relief of headache was noted in 54 per cent. Detailed observations concerning the cerebrospinal-fluid pressure, pulse, blood pressure, respiration, and psychological state were recorded in 10 experiments.

Included in the detailed studies were 2 patients without evidence of disease of the central nervous system. In each experiment on the 2 subjects a slight reduction in cerebrospinal-fluid pressure was effected and sustained for a period of more than two hours.

In 4 of the 5 patients in whom an elevation in cerebrospinal-fluid tension was demonstrated, the injection of sorbitol produced an immediate reduction in the pressure, followed by a secondary rise to a level higher than that observed prior to the injection. In a patient who had sustained a recent craniocerebral trauma there was an immediate progressive rise in the cerebrospinal-fluid pressure to twice the original level which followed the injection.

In general, the action of sorbitol as measured by the reduction in cerebrospinal-fluid pressure is comparable to dextrose, but less satisfactory than sucrose. The frequent occurrence of chills following the intravenous injection of this chemical militates against its use as a dehydrating agent.

J. M. MORA, M.D.

Altshuler, S. S., Hessel, H. M., and Sahyun, M.:
The Maintenance of Nitrogen Equilibrium of
Amino-Acids Administered Parenterally. *Am. J. M. Sc.*, 1940, 100, 39.

The maintenance of an adequate state of nutrition in surgical and medical patients when enforced fasting is unavoidable can be accomplished by parenteral feeding. Glucose infusions contribute the necessary fluid requirement as well as calories for energy. However the continuous destruction of body proteins necessitates the administration of protein for replacement. Proteins foreign to the human body and dissimilation products of protein as far down as peptones cannot be administered parenterally because they produce anaphylactic reactions. However amino acids do not cause such reactions when given parenterally.

The authors used a mixture of amino-acids which was hydrolyzate of casein to which has been added .8 per cent tryptophan and 1.5 per cent cystine. It contained 1 per cent nitrogen, 5 per cent glucose, traces of calcium ions, 0.5 per cent potassium chloride and .7 per cent sodium chloride. This made a clear amber-colored fluid with distinct smell of meat broth. Determinations showed it to contain about 7 gm. of amino-acid nitrogen per 100 cc. and that it was sterile in anaerobic culture. This mixture was injected intravenously into rabbits without anaphylactic reaction.

In patients this amino-acid solution was administered intravenously and also subcutaneously. The injections were uniformly well tolerated. The mixture was diluted with an equal amount of sterile water which had been warmed to body temperature. The time required for the injection of 100 cc. of fluid was judged to be the comfort of the patient as usually from four to five hours. The resorption time was found to be up to twelve hours.

The following are the authors' conclusions:
A mixture of amino acids containing all the essential amino acids has been prepared which can be administered to normal and postoperative patients subcutaneously or intravenously without untoward reactions. Both subcutaneous and intravenous methods of injections are found to be efficient. The parenteral administration of amino acids mixture could be substituted for protein in the diet to maintain the patient in nitrogen balance. In postoperative cases where food intake is not possible, the amino acid mixture was almost completely utilized and added toward maintaining nitrogen equilibrium.

SAMUEL H. KLEIN, M.D.

Sampels, S. S.: Leg Amputations in Diabetic Gangrene. *J. Surg.* 1940, 95.

There are three major indications for amputation in diabetic gangrene: (1) the rapid spread of the gangrenous process; (2) no signs of healing or of the formation of a line of demarcation; and (3) uncontrollable infection of the foot.

Previous teachings advocated leaving the stump wide open, only partially suturing the stump, or

inserting united sutures when amputation was done in the presence of infection. The mortality which occurred following these types of amputation was extremely high, and the morbidity was prolonged. The author believes that these precautions against infection of the stump are unnecessary and often dangerous even if severe infection is present. Amputation can be done with a low mortality if the operation is performed as simply as possible and if proper postoperative care is carried out.

Delaying operation in the presence of infection for the purpose of rendering the patient sugar free may prove disastrous. The presence of undrained infectious material will make the control of the diabetes difficult. Immediate removal of the infected area is indicated regardless of the diabetic status.

The author believes that cyclopropane is the best anesthetic for amputation, and points out the advantages of its use over ether and spinal anesthesia.

In regard to the operation itself, the proper preparation and draping of the operative field is of utmost importance. A tourniquet is contraindicated in all cases. The amputation level of choice is in the thigh just above the condyles of the femur. A simple circular incision is made just above the upper border of the patella, the formation of flaps being avoided. The soft tissues under the skin are likewise cut in one plane. All vessels are clamped as they are cut. The popliteal artery lies close to the bone posteriorly. The sciatic nerve is cut without injecting it. Retraction of the severed soft tissues is accomplished with moist towels, the periosteum then being scraped from the bone distally, and the bone exposed through. Fine silk is used for ligatures. A few fine silk sutures are used to approximate the muscles and fascia, and skin closure is done with fine silk or silkworm gut, no drains being used.

The patient is allowed up the first postoperative day. He may begin to use crutches after the first week, and he is permitted to go home in one week or ten days. The diabetes is then brought under control, and usually much less insulin is needed after the operation than would be required if infection were present.

Occasionally amputation may be performed below the knee, in which case the oscillometric reading must be .50 or more at the ankle level. Such an amputation is best performed about 8 in. below the knee. The fibula is amputated at a high level through longitudinal incision by means of Gigli saw. The procedure then is the same as has been described.

LUTHER H. WOLFE, M.D.

Hooton, C. F.: Some Physical Factors Regarding Cargat Ligatures and Catgut Knots. *Ann. Surg.* 1940, 47.

The rate of absorption of catgut and, therefore, the reliability of the material depends mainly on physical factors rather than upon the chemical method by which the material is treated. The most important factor which influences absorption is the character of the knot. The only surgically efficient

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knot is the reef or square knot, which must be made in such a manner that the twists in the catgut ligature itself are maintained. The surgeon should remember that catgut is usually spun in a clockwise direction and that its original tensile strength depends on the number of twists per inch. When the catgut is placed in the wound it absorbs water and swells in its transverse diameter. This tends to undo the twist, separate the strands, and expose more of the ligature to digestion by tissue juice. Such a cycle of events leads to more rapid dissolution of the knot.

The author recommends that the material be wound transversely and in a clockwise direction on a bobbin. Then when the surgeon unwinds the material for use, he makes tension draw the ligature straight and thus flattens the coils and increases the degree of twist originally made in the manufacture of the ligature.

Experimentally, the author placed knotted loops in the abdominal walls of guinea pigs using material twisted in the manner described above. In the control group he used knotted loops made with material just as it was removed from the manufacturer's tube. In the first group, he observed that the material was turned on its long axis, whereas the knot in the control group remained circular. Absorption was more rapid in the control group. In a second series of experiments, straight strands of catgut were compared with some of the same material which was knotted in loops. The straight strands were absorbed more rapidly than the knotted loops. This was due to the maintenance of the twist in the material by the knots. Material which was not wound in the manner described with trypsin more rapidly by a 2 per cent solution of trypsin.

The author observed a decreased tendency toward separation of wound surfaces and adhesion formation whenever the peritoneum was closed with the chromic catgut twisted by his method. These experiences were applied to clinical surgery. All the important knots were tied personally by the author. He used the square knot consisting of three throws. The first knot was tied in a clockwise direction and under tension. The second throw was a left hand counter clockwise knot for locking only, the third tie was again made in a clockwise direction and under tension.

The author believes that his postoperative results have been improved as a result of this change in technique.

BENJAMIN G. P. SHAFIROFF, M.D.

Ferracani, R. S. Postoperative Disturbances of the Protein Metabolism — Hyperpolypeptidemia
(Las perturbaciones post operatorias del metabolismo protéico (La hiperpolipeptidemia)) *Rev méd quirúrg de patol femenina*, 1940, 8, 467

The object of the present study has been to note the variations in the polypeptidemia in relation to the modifications in the blood as a result of the humoral disequilibrium in the postoperative patient. Normally the polypeptids of the circulating blood

fluctuate between 20 and 40 mgm per 1000 according to the processes of tissue autolysis and digestion and are transformed by the liver into urea which is temporarily increased. In the study of hyperpolypeptidemia three factors should be considered: (1) tissue polypeptidtoxia, which is caused by tissue disintegration as occurs in cancer cachexia and traumatism, (2) renal polypeptidtoxia (renal impermeability as occurs in azotemic nephritis, which increases the blood polypeptids or relative renal sufficiency may do this), and (3) hepatic polypeptidtoxia, which is due to insufficient transformation of the polypeptids into urea. The polypeptids occupy an intermediate place in nitrogen metabolism between the more complex peptones and the simpler amino acids. The liver has a limited capacity for deamidization of the polypeptids, when it is flooded with the latter a relative hepatic insufficiency occurs and there is an excess of polypeptids in the blood. In a previous report the author noted that the most elevated values of the blood polypeptids occur when the liver is severely affected, this is shown also by the hepatic function tests (galactose and rose bengal). The author presents a few tables concerning patients with severe hepatic involvement to support these views.

The postoperative liberation of tissue proteins as the result of surgical trauma aggravates the postoperative toxemia, which is demonstrated clinically by dehydration, adynamia, vomiting, meteorism, oliguria, ileus, and nervous symptoms. The recovery depends on the anti toxic properties of the organism. The postoperative chloropenia aggravates the toxic manifestations. The nitrogenous products exert their toxic action on the respiratory center by increasing its excitability, with a consequent increase in the elimination of carbon dioxide from the lungs. The resultant decrease in the concentration of the alveolar carbon dioxide induces a fall in the alkaline reserve. The author presents a series of observations illustrating this phenomenon.

Duval and Roux have studied the prognostic significance of the azotemia simultaneously compared with the polypeptidemia. They conclude that a good prognosis is afforded by increasing azotemia associated with decreasing polypeptidemia, a reserved prognosis is indicated when there is increasing azotemia associated with persistent or increasing polypeptidemia, and a bad prognosis when there is a normal or slightly elevated azotemia with a very marked polypeptidemia.

The author has carried out similar studies and his findings confirm the conclusions of Duval and Roux. He presents a series of data based on such studies of postoperative patients. He believes with Duval and Roux that the simultaneous study of azotemia and polypeptidemia indicates with absolute precision the process of transformation of the polypeptids. When this does not occur and there is a persistent hyperpolypeptidemia the prognosis is grave. The treatment consists of restoration of the chlorides, improvement of the glycogenic reserve of

the liver by giving glucose and insulin, and administration of fluids to aid elimination. For restoring the chloride to c.c.m. of hypertonic saline solution may be given intravenously two or three times daily. Fluids are given hypodermically in the form of normal saline solution. Glucose and insulin may be given intravenously. Prevention of hyperpolypeptidemia requires the careful preparation of the patient before operation is undertaken, particularly the administration of fluids and glucose.

JACOB E. KERRY, M.D.

Culp, O. S. Postoperative Venous Thrombosis and Pulmonary Embolism. *Bull. Johns Hopkins Hosp. Balt.* 940, 67

Among 863 surgical cases operated on at the Brady Institute during the past twenty years, there have been 83 cases of pulmonary embolism. An analysis of these cases has been made and almost every factor that could possibly have any bearing upon them has been carefully scrutinized. A considerably larger proportion of fatalities occurred among the private cases than among the cases in the public ward, but no definite conclusion could be reached as to why this occurred. Most of the 3 cases of proved fatal pulmonary embolism occurred during the past ten years among private patients over sixty years of age, and after operations performed under spinal anesthesia. Continuous intravenous infusions appeared to be a factor in the production of thrombosis in the lower extremities in 4 cases. Various other factors were probably contributing factors in individual cases, but there were no common factors. In only 8.8 per cent of the fatal cases was thrombosis recognized clinically before death. Some patients were subjected to operation or allowed out of bed in the presence of unrecognized thrombosis of lower extremity with almost immediately fatal results. Any untimely activity in chiding the use of bedpans, seemed to be capable of dislodging the thrombus.

In the past year routine leg measurements, beginning at the malleoli 1 cm. level and upward have been used. In the presence of thrombosis, it has been found that there is almost always a distinct difference in the size of the two legs even though no asymmetry was apparent on inspection. By applying this criterion 9 cases have been recognized during the past year. Of these 7 would have been recognized clinically under any circumstances but they were recognized earlier and adequate treatment was immediately instituted. This consisted of bed rest, absolute quiet, elevation of the affected leg, and the application of heat.

As a result of this study the following recommendations are offered:

Continuous intravenous infusion sets should be used as little as possible.

Every effort should be made to decrease venous stasis.

3. Wound infections should be kept to the lowest rate possible.

4. Great care should be exercised in the early recognition of the condition. The measurement of the legs seems to offer the greatest chance for this.

Any untimely activity should be avoided. The author is convinced that bedrest is the most conservative and the most practicable form of treatment.

JOHN WILLIAM ELLON, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Elkinton, J. R., Wolff, W. A., and Lee, W. E. Plasma Transfusion in the Treatment of the Fluid Shift in Severe Burns. *Ann. Surg.* 940, 59

The mechanism and treatment of the fluid imbalance that occurs in severe burns is a special problem in surgical physiology. Plasma transfusions have been studied as a treatment for the shift of body fluids that occurs during the first three days. The authors have provided a method of estimating the quantity of protein replacement necessary, and have determined the time at which the capillaries regain their impermeability to protein.

The decrease in the fluid fraction of the blood is a common phenomenon that is associated with severe burns. Experimental and clinical studies which have done much to clarify this mechanism as hemocoagulation, are reviewed. These observations indicate the fundamental mechanism of the fluid imbalance which occurs during the first few hours. Capillary tests and altered permeability in the burned area permit the passage of plasma proteins across the capillary membrane with corresponding disturbance of the osmotic pressure relationship. As a result, tissues fluids are increased and plasma volume is diminished. This is a fluid imbalance or abnormal distribution of fluid rather than an external loss.

This conception leads to certain logical deductions: clearly the fluid lost from the vascular compartment is the tissues would best be returned by replacing the lost plasma protein. This would raise the plasma osmotic pressure sufficient to restore and maintain the normal distribution of fluid between the intravascular and interstitial compartments. Three factors must be considered: first, the time at which the capillaries in the burned area regain their impermeability; and, second, the total amount of protein required. The need for water and electrolytes is moderate as the excess fluid in the tissues should be available when the plasma osmotic pressure is restored to normal. Water intoxication may result when large amounts of water are given because the lowered plasma volume and plasma protein concentration interfere with the normal renal defense by diuresis.

The authors have devised a method whereby during this period of fluid shift it is possible to estimate the plasma protein deficit and the quantity of plasma necessary to restore its volume to normal. Hematocrit and plasma-protein determinations

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made every few hours, are the only factors necessary to complete the formula.

The summary of 5 cases so treated is reported. Evidence is presented that the loss of plasma protein continues until the thirty first to the fortieth hour. During this period excessive hemoconcentration may be prevented by the use of small repeated plasma transfusions. After the fortieth hour, when the capillaries have regained their impermeability to protein, the deficit of plasma protein may be corrected quantitatively by a large plasma transfusion.

The plasma used in the transfusions was obtained by centrifuging citrated whole blood, plasma was pooled from any type of blood available and no reactions were observed. It was given undiluted in order to obtain the maximum osmotic effect.

HARVEY S. ALLEN, M.D.

Sommer, R. *Surgery in Electrical Injuries* (Chirurgie bei elektrischen Schoeden) 64 Tag d deutsch Ges f Chir, Berlin, 1940

The number of electrical current injuries has definitely not kept pace with the electrification of our environment. Current injuries are rare, as only organic injuries come to treatment, each source of accident is immediately corrected, and most of the cases result only among individuals with electrical vocations. In mining, the last decade shows a reduction in incidence to one third of that for the years from 1919 to 1929.

Physical observations. Tension and strength of the current are not sharply differentiated, but a great predominance of one or the other determines certain types of injuries. Excessive tension causes current burns and contributes to severe carbonization, passage through the head results in immediate loss of consciousness. As a flaming arch, it leads to severe necrosis, as spark formation, it may produce metallization of the tissues. Metallized tissue cleanses itself, since the metal spray, in contrast to tattooing, lies in the epidermis. High tensions lead to the dissolution of bone in the form of fine globules of calcium phosphate (calcination). As a result of tissue resistance current strength is transformed into Joule's heat, and produces coagulation of the albumin molecule, evaporation of tissue fluid, cooking, and carbonization. The effectiveness of current strength in the body depends upon the protection against grounding.

Weak currents, from 60 ma to 4 amp, passing through the heart will cause death from fibrillation. Tissue resistance is difficult to measure because of other factors which are constantly varying. The important factor is that the skin at the sites of entrance and exit offers great resistance, however, vessels show low resistance, sufficient however, to produce considerable heat even over short distances. The impression that different people display significant variations in the effects of electrical currents is only partially correct. Workings or persons with heart disease are not especially endangered. On the other hand individuals with status thymolym-

phaticus, who are known to be very sensitive to narcosis, are particularly in jeopardy from electricity, as Schridde's experiments have shown. Current sensitivity, suggested by Jellinek, is denied, since the same current strength in the same tissue resistance always produces the same Joule heat and the same consequent tissue damage. These statements depend always upon the degree of grounding of the body.

Three clinical subdivisions are made *1. Injury from current entering through one extremity.* This is usually a hand. These cases are the most numerous and include all trivial injuries, all intermediate injuries up to the most severe carbonizations, and instances of sudden cardiac death. The various forms of current burns are described, by the form of their yellow edges they permit the recognition of the heat honeycombs of Schridde. These are produced by evaporation and explosion of the tissue fluid, which cause cavity formation and tearing as well as to shot like transitional forms to charring as well as to shot like cutaneous injury. There is often edema formation in the adjacent areas, and in loose portions of the skin it may be extensive. Edema of vasomotor origin is transitory, however, if it is due to lymphatic or vascular damage it may be very resistant. Thromboses are rarely seen. There is no specific electrical edema.

Progressive lesions are those in which there are necroses of the skin produced by a second circuit in high tension currents, at such sites where folds occur (wrist or elbow) or where the clothes fit tightly. Moistness of the skin probably produces such parallel circuits more easily. Lightning figures in the skin are due to organic, intra epidermal heat effects. The figure formation does not depend upon contacts with the vascular tree or the nerve distribution, but upon the character of the diffusion of the current. After penetration of the skin of the finger or hand, gross damage is provoked in the tissues if the current is strong enough the muscles appear cooked the tendons are necrotic, vascular bundles are swollen and edematous and the vascular walls are brittle. The total injury is sustained at the instant of the accident and its extent then determined, but it may escape the eye because the skin often appears entirely normal. Later, however, the skin dies of insufficient nutrition and the finger or hand becomes mummified. Because of the sudden death of the tissues, conduction of the nerves is interrupted with total absence of pain, and because of vascular death there is absence of all body reaction. There is no fever, swelling, inflammatory complications depends, however, upon the absence of secondary inflammation. Treatment therefore consists of the maintenance of sterility, for which powder dressings have proved of greatest value. Most compresses, irrigation and ointments are not recommended. Conditions are just the reverse of those found in ordinary burns (damaged skin and

normal tissues). Debridement is avoided entirely as the limits of viability cannot be determined. Expectant sterile treatment is maintained for from one to two weeks; then the necrotic portions are removed to avoid hemorrhage or infection. Fatal hemorrhage is very rare. Even when the joints are deeply opened, simple sterile management is used. If infection occurs, necroses are immediately removed, abscesses opened, pockets freely broken up, and muscle sequestra excised.

2. *Injury from current entering through the head.* These cases are far less numerous. The injured persons have the feeling of remaining attached to the current because of the general contraction of all the skeletal muscles, and then suddenly when the current is broken the feeling of being thrown by force of muscle action. The special character of these injuries is due to the broad site of entrance of the current and to the absence of good-conducting, large muscle masses with consequent damage to the bony skull. Loss of consciousness is general.

The regenerative power of the flat bones of the skull is very poor and the course of the necrosis is very slow. Removal of sequestra is very dangerous because the extent of the damage beneath the skull is not known, and the exercise of force may cause severe hemorrhage. Secondary tearing of the meninges. All gradations of injury to complete extrusion of the bone membranes, and a cerebral hemisphere, are known. The brain and meninges are constant sources of danger. The first treatment is for the loss of consciousness. Because of this and also because of irritative and paralytic manifestations, epileptic convulsions, and edema of the brain, immediate spinal puncture and dehydration therapy with hypertonic solutions should be instituted. Local treatment is expectant. Operative intervention is indicated in abscesses. In head injuries there are often multiple, radial opacities of the lenses of the eyes, which, however, improve spontaneously after several months.

3. *Combined injuries.* These are usually severe charings and necroses of the entire body. They occur most frequently in transformer buildings where uninformed laborers touch the wires and fall. The injuries are entirely unpredictable and are often fatal. The musculature in electrical injuries often presents cooked appearance. There is liquefaction of the contracted substance to the point of charring. Broad transverse bands, as described by Schmidt and Schridde or muscle sparks according to Jellinek, appear to be infrequent isolated findings. This is true also of the rotated vessels of the media of the vessels of Pietruski and Huber. Jellinek has described the so-called schism of the bones. If one starts with the basic fact that the current always passes through the soft tissues first, because of the poor conductivity of bone, the various observations in the literature of bone injuries following harmless electric shocks do not appear plausible. Either careful surgical studies are necessary to obtain a correct interpretation of these reports.

In the three types of cases mentioned secondary injuries were frequently noted: (1) fractures and dislocations resulting from the patients being thrown, which had nothing to do with the specific current action; (2) dislocations of the shoulder; tearing of the skeletal system because of tetanic muscle contractions; and (3) true burns from the burning of oil-soaked clothing. Kidney disturbance in patients injured by electricity appear to be due to the true burns.

An electrocardiogram should be made in every electrical injury since disturbances in conduction often result. These usually disappear quickly. Every patient with cutaneous necroses should be given prophylactic tetanus serum because tetanus often follows such injuries.

Sudden electrical death is not discussed because lack of time but it appears extremely unlikely. If such death is due to asphyxia, as Jellinek has stated. It is much more probably the result of irreparable cardiac fibrillation which causes death in a few minutes. (SOMMER) LEO M. ZIMMERMAN, M.D.

Key, J. A., and Burford, T. H. The Local Implantation of Sulfanilamide in Compound Fractures: Its Effect on Healing. *South. M. J.* 94: 33-44-9.

Following the results obtained by Jensen, Johnson, and Nelson, the authors believed it evident that the local implantation of sulfanilamide in contaminated wounds affords a high degree of protection against staphylococci, but the administration of the same amount of the drug systemically afforded no protection and that the local implantation of sulfanilamide in recently contaminated compound fracture or other wound, is a highly efficient method of combating infection in the wound if debridement is done and the wound is sutured.

The authors observed that Brecker and Grabar have recently noted that wounds in the stomach of dogs, when sulfanilamide had been given in therapeutically effective amounts, tended to heal more slowly than did similar wounds in normal controls, and thus brought up the question in their minds whether or not the local implantation of sulfanilamide is an unmixed blessing.

In order to determine whether the local implantation of sulfanilamide in compound fracture inhibits the healing of bone bilaterally approximately symmetrical fractures were produced in one bone in each foreleg of a series of 3 rabbits. The other bone remained intact and served as a splint. The operations, performed under general anesthesia and with aseptic technique are described in detail. The animals were sacrificed in periods of from five to fifty-six days after the fractures of the bones of the forelegs were removed and the control legs were grossly compared as to the amount of callus present, and the firmness of the union of the fracture. Later the specimens were fixed in 10 per cent formalin and x-rayed still later the bones were decalcified in nitric acid and sections of the fractured areas

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were cut, stained with hematoxylin and eosin, and studied microscopically.

In order to determine efficiently how seriously the maintenance of sulfanilamide in therapeutic concentration affected the rate of union in fractured bones, the authors produced 12 experimental fractures in the ulnas of 6 dogs. These fractures were so timed that when the animals were sacrificed they had fractures at weekly intervals of from one to six weeks in each of two groups of three dogs. All 3 dogs served as controls and each of the other 3 was given 0.3 gm of sulfanilamide a day. As a result of these experiments, the authors noticed no difference as to the amount of callus and firmness of union of the fractures between the controlled and uncontrolled cases. In those fixed with formalin and x-rayed, the study of the roentgenograms revealed only minor differences in the degree or callus present, and in the degree or manner of bone formation and union present in the right and left legs of the same animal. The studies of the bones decalcified in nitric acid and sectioned revealed no important or constant differences in the degree or manner of bone formation present between the fractures treated with sulfanilamide and those of the controlled bones. The authors did not believe that the concentration of the drugs in their experiments was sufficiently high or maintained over a long enough period to affect the rate of union on the control side.

From their clinical experiences and experimental observations, the authors conclude that the local implantation of sulfanilamide crystals in compound fractures not only tends to lessen the degree of infection, but also does not interfere with union of the soft parts or of bone. EMIL C. ROBITSHEK, M.D.

Girdlestone, G. R. Closed Plaster Treatment of Infected Wounds. *Lancet*, 1940, 239 31

The surgeons of the last war abandoned antiseptics in favor of débridement. Later, Winnett Orr enclosed the wound, and we owe the finer developments of the technique and its adaptation to varying degrees of destruction and infection to Trueta. Trueta lays stress on (a) the good vascularity of the tissues left after débridement, (b) the avoidance of any trauma or antiseptic application to these tissues, (c) the avoidance of tight packing of the wound or other firm pressure on exposed tissues, and (d) the application of gentle uniform pressure over a thin and evenly applied vaselined gauze dressing.

The success of the closed plaster method depends upon its correct application to the individual case. It can be used in a dirty wound after excision or longer practicable, provided complete sepsis has been performed, excision is generally contraindicated in the presence of established sepsis, whereas saucerization is indicated. When joints must be immobilized, they should be placed in a position of maximum function, since stiffness usually

The case reported was that of a man, aged forty-nine, who had his left forearm half severed just below the elbow by a circular saw. The main nerves and vessels escaped. The wound became infected, and three days later he was transferred to the Wingfield-Morris Orthopedic Hospital. The wound was completely saucerized, the necrotic edges of the skin were excised, all pockets were opened. The surface was covered with a thin layer of fine-mesh vaseline gauze, a few layers of gauze, and, finally, plaster-of-Paris. There was a visible depression in the surface of the plaster where it followed the contour of the wound. The condition of the part improved, and the general condition of the patient improved, so that three weeks later, when the case was bivalved, the wound was found to be covered with healthy granulations. It was redressed and replastered. The plaster was changed approximately every three weeks, and after the second change the wound was almost healed. Six months later the patient had regained 55 degrees of motion in his elbow joint. This shows how a man can be saved and useful motion of the joint regained.

In wounds unsuccessfully treated by excision and suture, the entire procedure, as in the case here described, may be necessary. It includes

1. The débridement. The general rule is to excise, as far as practicable, infected tissues and tissues devitalized by bruising or by the impairment of circulation. This rule governs the excision of skin, connective tissue, and muscle, surgical sense will guide the operator on more delicate ground.
2. Opening the wound rather than suturing when suture would involve tension and devitalization of the skin or deep parts.

3. A varying degree of "saucerization," which allows natural retraction of the muscles to the position of equilibrium and involves a laying open for free drainage of all pockets or areas of heavily infected or damaged tissue which cannot properly be excised. For serious destructive wounds the requirements vary from the saucer to the cup, but there are many wounds, earlier and less destructive, in which no such formal exposure of the deep tissues is indicated. At times nothing more may be needed than a single layer of broad wick laid between the edges of the wound after débridement.

4. The plaster splintage with its dual purpose (a) the restoration of function, by keeping the bones, joints, and muscles at rest in the chosen position, and (b) defense against the spread of infection, by keeping the reactionary cellular infiltration undisturbed in the tissues and lymph channels around the wound. This is favored by

5. A particular technique of enclosure of the wound in that part of the plaster which covers the exposed tissues. It should apply an even gentle pressure similar to that normally exercised by the fasciæ and the skin.

6. The elimination of frequent dressings, which mean either pain or repeated anesthesia for the patient and are both time-consuming and expensive.

If this closed plaster method is to give results as good as those for bomb wound in Barcelona or gunshot wounds in Madrid those who use it must fully understand each process. Unfortunately plaster technique receives little attention in our medical schools. Few students or house officers have the opportunities of learning how to apply extensive plasters which will accurately and comfortably control the whole trunk and one limb. If a wound is to do a limb must first be given appropriate operative treatment after this the progress of the wound and the comfort of the patient depend on the fit and inner smoothness of the plaster.

JOSE E. KEMPATRICK, M.D.

NEW H. C. E., and McVea, C. The Prophylactic Use of Tetanus Antitoxin: An Analysis of 500 Cases. *South. M. J.* 1910, 23, 96.

The effect of the prophylactic administration of tetanus antitoxin in 500 consecutive cases as carefully studied by the authors. In this series there were 45 males and 85 females, of whom 373 were white and 127 colored. In 38 per cent of the patients there was a history of previous serum treatment. Of this group 9.6 per cent gave a history of previous reaction. Other forms of allergy in this series were asthma in 1 per cent, hay fever in 9 per cent, and urticaria in 1 per cent.

About 20 per cent of the patients. Thirty-seven were found sensitive to tetanus toxin. Fifteen hundred units of five different brands of antitoxin were injected in 456 patients. Intramuscular injection was given ten times more frequently than subcutaneous injection. In 24 patients the dose was fractionated. In the other 476 patients it was given in a single dose. Fifty-nine or 8 per cent of the group developed reactions. Seventeen of the latter group suffered general as well as local reactions.

An immediate reaction occurred in 3 instances of which might be associated with psychic syncope. None of these showed a delayed reaction later. The delayed reaction varied in time from two hours to ten days. It resulted in either a local manifestation or serum disease. The local reaction was characterized as either red area of tenderness or area of edema, inflammation, and urticaria, with or without desquamation. Only one patient developed a local superficial abscess.

Serum sickness occurred on the fifth to the eighth day in 4.4 per cent of the patients. It was treated by the subcutaneous injection of from 3 to 5 minims of epinephrine, or the administration of ephedrine (36 gr.) with an equal amount of sodium pentobarbital by mouth. Phenol and calamine liniment was used for urticaria and pruritus. Saline laxative or milk of magnesia as also prescribed.

The number of reactions, according to the authors, did not depend upon the brand used but rather on the sensitivity of the individual. There seemed to be a greater incidence of reactions in

July and August. Reactions occurred in 1 per cent of the negro patients and in 2 per cent of the white patients. No cases of anular or annular palpable eruptions resulted.

Epinephrine mixed with tetanus antitoxin diminished the incidence of serum sickness. Calcium gluconate did not prove of any prophylactic value. The authors conclude that in spite of the increased use of therapeutic sera, the administration of tetanus antitoxin is rarely attended by serious complications. BRUNNEN G. P. SEUMER, M.D.

SHUMACKER, H. B., J. FIOR, W. M., and LAMON. A. The Therapeutic Use of Antitoxin in Experimental Tetanus. *Surgery* 1910, 3.

Experimenters are reported which demonstrate that tetanus toxin administered intrathecally is superior to that given intravenously. Guinea pigs having received more than a lethal dose of tetanus toxin and exhibiting local tetanus, and then depopulated with more than a lethal dose of toxin in a bowl signs of both local and general tetanus. It is assumed that the antitoxin can pass from the cerebrospinal fluid into the substance of the central nervous system which could explain its great therapeutic efficiency when used intrathecally.

Most workers in this problem have found the intrathecal route to be superior to the intravenous. The failures are explained by the authors as follows:

From our own work it is apparent that, if animals are treated early enough with sufficient dose of antitoxin, all will survive, whether treated by the intrathecal or the intravenous method and the converse, namely, if the treatment is delayed so long that a fatal amount of toxin has been already fixed, toxin given by either route will be futile. Furthermore, if one treats animals in between these two periods that is to say, if they have more advanced symptoms than in the first instance and yet have not undergone fixation of a lethal dose as in the second, success or failure in finding the intrathecal route superior will depend upon varying the dose upon selecting proper single dose. Too small a dose may fail to demonstrate difference between the intrathecal and intravenous routes.

SAMUEL H. KLEIN, M.D.

MACHLE, T. J. Some Aspects of Streptococcal Infection. A Review. *Lancet* 1910, 2, 910, 47.

On some aspects of streptococcal infection considered in this short review. The natural habitat of streptococci, which are widely distributed under natural conditions, is particularly in the mucous surfaces of the mouth, throat, nose, and intestinal tract. A mucous surface is the most frequent point of entry. The marked variations in effect, from the mild to severe fulminating infections, are due both to the virulence of the organism and to the immunological state of the person attacked.

Various classifications of streptococci have been suggested. The convenient, but excessively simple differentiation between hemolytic forms and green

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producing forms found in the mouth, and other strains found in the intestinal tract is discussed. The various toxins produced by hemolytic strains are mentioned. Attempts to subdivide streptococci serologically are described and the group classification introduced by Lancefield is commented upon. Present systems of classification have not elicited any essential differences between the hemolytic streptococci of scarlatina, erysipelas, puerperal sepsis, acute tonsillitis, and suppurative lesions, respectively. Present knowledge concerning the rôle of streptococci in these diseases and in rheumatic fever are reviewed. The great problem of droplet and air-borne infections of the upper respiratory tract remains.

To increase individual resistance general measures to improve hygiene and nutrition are still the only practicable methods available. The results of chemotherapy with the sulfonamide compounds in combating infection are promising. Already these drugs have been found to control certain forms of streptococcal infection which might otherwise have serious or fatal results.

WALTER H. NADLER, M.D.

Pearse, H. E., and Ziegler, H. R. Is the Conservative Treatment of Infection or Gangrene in Diabetic Patients Worth While? *Surgery*, 1940, 8: 72

Pearse and Ziegler studied 211 diabetic patients who were admitted to the hospital with infected, pregangrenous, or gangrenous lesions of the feet. This study was made to determine the value of conservative treatment of these lesions.

The data demonstrate that adequate treatment of gangrene in diabetes requires evaluation of the factors of circulation and infection, for upon these rests the type of therapy and the result. Conservative non-operative treatment of superficial lesions is proper in all degrees of circulatory damage so long as the lesion or infection does not extend into the foot. This course was justified by a cure of 25 per cent of the cases by this method. There is often no alternative but leg amputation. Conservative operative treatment on the foot is indicated in cases with an adequate circulation (good or normal). Leg amputation is usually a needless sacrifice. The authors obtained cures by operation on the foot in 90 per cent of these cases. The failure of the first operation does not increase the mortality or reduce the prospect of success of subsequent procedures, it only prolongs the hospital stay. Patients with an inadequate circulation (fair or poor) and who have ischemic gangrene should not be treated conservatively, for delay or local operation may permit infection of the foot. A primary leg amputation is indicated. Patients with inadequate circulation who have infection in the foot may be treated by local operation without increased risk, but the results are poor—the wound heals in very few patients even after a prolonged hospital stay. Patients with acute infection in the foot should never have a primary leg amputation for the mortality rate was 45 per cent in this series. On

the other hand, patients without acute infection gave a 12 per cent mortality from leg amputation. The authors believe that patients with an inadequate circulation and who have an acute infection are best treated by removal of the infected foot, followed by leg amputation at a later date. J. M. MORA, M.D.

ANESTHESIA

Case, E. H. Trichlorethanol. *Animal Experimentation Anes & Anal*, 1940, 19: 216

Tribromethanol has been widely known and used as a basal anesthetic for a number of years. Trichlorethanol, a similar compound, with chlorine substituted for the bromine, has received scant attention. In view of the similarity of trichlorethanol, of which the physical properties are known, to tribromethanol, an investigation of its pharmacological action was carried out on rats, rabbits, and dogs.

Respiration was depressed in all groups of animals by both drugs. With equal doses per kilogram of body weight, tribromethanol produced a greater depression of the rate in rabbits, and of the rate and minute volume in dogs. When the same hypnotic effect was obtained, there was no consistent difference.

The repeated administration of tribromethanol and trichlorethanol to rats and rabbits produced no pathological changes in the liver, kidneys, and heart.

The repeated administration of trichlorethanol to dogs produced mild fatty degeneration of the liver, while even a less severe degeneration followed the repeated administration of tribromethanol. A slight parenchymatous degeneration occurred in the liver of 1 dog that received trichlorethanol, but in none that received tribromethanol.

Mild fatty degeneration in the kidneys was produced following the use of both drugs. No pathological changes occurred in the heart. Liver function was affected to approximately the same extent by each of the two drugs.

Studies on trichlorethanol are in a preliminary stage, and much more must be known before recommendations for its clinical use can be made.

SAMUEL KAHN, M.D.

Woodbridge, P. D. Indications and Contraindications of Spinal Anesthesia. *Surg Clin North Am*, 1940, 20: 615

At the present time, spinal anesthesia is used almost to the exclusion of other types of anesthesia for abdominal operations at the Lahey Clinic. Several reasons are given for this: the fact that pontocaine and nupercaine, which are now used, produce longer anesthesia with less depression than do procaine and metycaine, the improved methods of management of patients under spinal anesthesia, the advantage of the relaxation which is produced, and the improvement in preliminary narcosis. It must be remembered that low spinal anesthesia is far safer than high spinal anesthesia.

Several distinct contraindications to the use of this type of anesthesia exist. Among these are disease of the central nervous system, fear of post-anesthetic sequelae, severe hemorrhage or anemia, shock, cardiac decompensation, coronary disease, and lack of an anesthetist.

The author has found that spinal anesthesia can be used safely in children when the occasion demands. Spinal anesthesia is indicated in the presence of disease of the respiratory tract. It is especially indicated in disease of the liver or kidneys because the drugs used do not depend upon these organs for their elimination as is the case with most general anesthetics. Metabolic diseases also constitute an indication for spinal anesthesia.

When relaxation of the abdomen, perineum or lower extremities is required, spinal anesthesia is particularly valuable. It is generally held that no other type of anesthesia will give as good abdominal relaxation. With the newer drugs, pontocaine and percaine, the author has found that meek, feeble elderly patients withstand gastrectomy very well. Patients with peritonitis tolerate pontocaine far better than the corresponding dose of procaine.

The drug used in spinal anesthesia makes contact with one system of the body and probably has very little effect outside of the central nervous system except upon the tone of the blood vessels. On the other hand, all general anesthetics make contact with all the tissues and undoubtedly alter them to some degree. This raises the question as to whether a long operation beneath the diaphragm does not constitute an indication for spinal, local, or other form of regional anesthesia in preference to any type of general anesthesia. JOHN A. GREY, M.D.

Chaffetz J. B. Efficacy of the Combination of Ephedrine and Pitresol as Pre-Anesthetic Medication in the Control of Blood Pressure During Spinal Anesthesia. *Ann. S. & G.* 1930, p. 1.

The fall in blood pressure is the most important and serious of the indirect results of spinal anesthesia. It is not an exaggeration to state that the repeated abandonment of this type of anesthesia is being too dangerous as due to lack of control of the blood pressure.

The present report is based on a series of 19 cases and three distinct techniques.

Technique 1. One gram of ephedrine (75 mgm.) is administered intramuscularly about eight or ten minutes before the spinal puncture.

Technique 2. A mixture of 56 gr. of ephedrine (4 mgm.) and 56 c.c.m. of pitresol is administered eight or ten minutes before the spinal puncture.

Technique 3. This is the same as Technique 2 but the dose is repeated just before the incision, provided the blood pressure shows a tendency to drop while the patient is being draped.

The comparative efficacy of these techniques was judged on the basis of drop in blood pressure within an hour after the puncture sufficient to justify the use of vasopressor drugs. As a rule if the pressure dropped to less than 80 or 90 (systolic) drugs were administered.

Administration of the spinal anesthetic was, with few exceptions, in accordance with the Howard Jones technique.

The drugs used as a rule are percaine (Ciba) 500 and procaine 0 per cent. In this series of cases more than 60 per cent of the patients are given opiate.

When ephedrine alone was used, the blood pressure dropped in 37.7 per cent of the cases. When the combination of ephedrine and pitresol as used eight or ten minutes before spinal puncture the blood pressure dropped in 10 per cent and when used twice, i.e., repeated just before the incision the blood pressure dropped in only 7.8 per cent. These figures speak for themselves. The combined groups gave a drop in blood pressure in 4.8 per cent.

One more factor of the maintenance of blood pressure may be considered. As far back as 1905 Babcock stressed the bulk and viscosity of the blood. There is usually some loss of blood during operation and sometimes this is considerable. It is logical to suppose that an intravenous injection of saline or saline and glucose solution will help stabilize the volume of blood disturbed by the incision and trauma. Among the patients on whom Techniques 1 and 3 were used, 3 came to the operating room while an intravenous injection was being given, and 70 per cent of these showed the smoothest blood pressure curves. JOHN J. MALONEY, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Moore, S. Practical Applications of Body-Section Roentgenography *Am J Roentgenol*, 1940, 44

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In body section roentgenography two things are accomplished the dispersion of unwanted shadows and the development of the minimum of density contrast in a thin layer of tissue. The author has used the method extensively for more than two years, and in this article he presents his impressions of its value in connection with various structures and conditions. Although the object of many examinations was to discover the usefulness of the method, the great majority of cases were subjected to it because of failure of other methods of examination.

In the chest, cavities and consolidations in the lungs can be demonstrated which are not apparent either roentgenoscopically or in conventional films. In connection with the paranasal sinuses, laminagraphic examinations are valuable to otolaryngologists, especially for the information they provide of the ethmoid and sphenoid groups of cells. Skull studies yield relatively little of value. The ascending ramus of the mandible and the temporomandibular joint can be shown particularly well, also the upper cervical vertebrae. Lateral laminagraphic views of the dorsal spine are valuable because distorting rib and lung shadows can be eliminated.

Body section roentgenography is the only satisfactory method of examining the sternum and its articulations with the clavicles. The lumbar spine, because of the lack of overlying, confusing shadows, is not a particularly favorable region for this type of investigation either in the lateral or anteroposterior projection. The sacrum can be investigated in the lateral projection to some advantage because the shadows of the innominate bones on either side of these vertebrae are shifted. For the bones of the extremities the method has not proved of great value, except for developing slight density contrast, such as would be produced by early central lesions. It is useful when patients are in plaster casts.

In disease of the alimentary tract no case has been encountered in which the laminagraphic examination was of value. The same is true as regards the urinary tract except in cases with unusual calcification. Abdominal aneurysms have been demonstrated with it. Generally speaking, body section roentgenography is of little use in the study of soft tissues.

ADOLPH HARTUNG, M D

Goldzieher, M. A. The Diagnostic Significance of Cranial Roentgenograms in Pituitary Disease *Endocrinology* 1940, 27 185

Growth of the facial cranium and development of the paranasal sinuses and mastoid cells are inhibited in the pituitary dwarf and in pituitary infantilism.

Conversely, excessive expansion of the cancellous bone and of the sinuses is noted in acromegaly, gigantism, and other instances of activity of the anterior lobe, such as obtains in eunuchoidism and in certain cases of precocious puberty or adiposogenital dystrophy of the tall variety.

Inadequate function of the anterior lobe of the pituitary gland during adult life yields a progressive diffuse sclerosis of the cranial bones which appears either in the previously normal cranium or is superimposed on an originally hypoplastic skull, it is particularly marked in previously overexpanded cancellous bone tissue. These changes appear ten times more frequently in the female.

The diagnostic significance of cranial dysplasia is borne out by a series of 500 consecutively studied cases of pituitary disease in 96 per cent of which these changes were present. Similar, although minor changes were noted in only 9 per cent of the control group, in which clinical evidence of pituitary disease was not obtained.

HAROLD C. OCHSNER, M D

Schillinger, R. An Opaque Survey of the Nasal Sinuses. A Method for Diagnosis of the Anatomical State of the Sinuses and of the Functional Capability of Their Membrane *Radiology*, 1940, 35 1

The use of opaque media in connection with studies of the nasal sinuses permits the demonstration of facts relating to the anatomical state and functional activity of those sinuses of which this information could not be obtained in any other manner. The author has utilized this means of diagnosis in several hundred cases and found it of inestimable value. He has evolved a technique for comprehensive study which he terms an "opaque survey," the details of which are tabulated and described at length. It consists of three phases, which he refers to as the control study, the displacement study, and the maxillary study. All of these are given detailed consideration as regards the objects, technique, and findings.

The indications for opaque survey are listed

1. Cases with persistent nasal symptoms and with few or no clinical findings. The survey is made to rule out or establish changes in the membrane itself and in its functional activity.
2. Cases with persistent nasal symptoms and with positive clinical findings, which do not yield readily to treatment. In these cases the survey is made to determine the location, extent, and type of the involvement.
3. Cases of constitutional disease resulting from focal infection, in which the upper respiratory tract is a possible focus.
4. Cases of bacterial allergy with asthma.
5. Cases of persistently recurring respiratory infection.

6 Cases of bronchiectasis.
7 All cases in which surgery is contemplated.

8. Cases of recurrent and chronic infection.

9. Cases of neuralgia of the face

a. Cases of brain symptoms referable to extension of infection from the sphenoid.

1. Cases of optic neuritis and iritis in which the cause is obscure.

2. Cases of sinusitis treated by irradiation and otherwise. In these cases the survey will be valuable as a means to check the results of such therapy.

The following conclusions are made:

The opaque-medium survey is a distinct aid to more accurate diagnosis. It is based on the conception that the sinus is a functional entity and not just a space that is affected not only by local disturbances but also by constitutional disturbances and that sinus disease is more commonly a disturbed physiology of the mucous membrane than a secondary histological change than a primary pathologic anatomical entity. The opaque-medium survey determines the dynamic as well as the static features of the sinuses. It is a safe and practical diagnostic method which has no contraindications. It offers valuable topographic information for surgical procedures. *LOUISE HARTMAN, M.D.*

Thoma, H. A Discussion of Roentgen Pelvimetry and the Description of Roentgen Pelvimeter
Am J Roentgenol 949, 44 9

The use of roentgen pelvimetry as a routine procedure in primigravida women has been regarded by the author for almost twenty years, and such practice has been followed in his clinic during the past six years with results which amply justify the procedure. Modern roentgen studies have definitely shown that external pelvimetric methods cannot be relied upon and that best can give but a general idea of pelvic room. If pelvimetry is to be at all useful

determining pelvic capacity accurate measurements of the bony pelvis must be made and these can be obtained only by roentgen methods. The expense involved hardly seems to justify rejection of the procedure inasmuch as the use of standard roentgen equipment with one or two inexpensive accessories and the exposure of ten by fifteen films is all that is necessary for an adequate routine pelvimetric survey.

The particular information which the method gives relates to pelvic diameters to the planes of the pelvic inlet and outlet and to the mid pelvic plane. Essential knowledge of the contours of the pelvic inlet and the shape of the sub-pubic arch, the sacrospinous notch, and the anterior surface of the sacrum can also be obtained by it. These diameters and contours are illustrated and discussed in some length.

As regards the technique used, brief consideration is given to the grid method for anteroposterior views and the lateral projection. The upright centimeter rod for roentgen pelvic measurement

which have been developed by the author and which have been described by him and others. In the present communication these appliances are eliminated and a method is described which uses a standard target film distance for both anteroposterior and lateral exposures and requires only special measuring calipers for translating information obtained from the roentgenogram into actual accurate measurements. A detailed description of the procedure followed and methods used for getting the desired data is included. The information which thus becomes available to the obstetrician will furnish him an adequate knowledge of the bony pelvis and its capacity. Employment of the method will result in better obstetrical care during labor.

ANNE HARTMAN, M.D.

Liebman, C., and Isaman, R. M. Osteochondritis Dissecans. *Am J Roentgenol* 949, 45 865

Osteochondritis dissecans is a disease characterized by the separation, partial or complete, of a piece of articular cartilage from the ends of certain long bones, with or without part of the subjacent bone. These changes occur almost exclusively in the knee and elbow. In the knee the lateral margin of the medial condyle of the femur is involved and in the elbow the capitellum of the humerus. Although Moore recognized in 1757 that loose bodies in joints originated from the articular surface, Koenig in 1879 was the first to classify osteochondritis dissecans as a distinct entity. Trauma in the form of direct violence, ligamentous pull, or injury to the arterial supply by long continued mild trauma is considered a predisposing factor. The disease process begins at the point of greatest contact in the knee joint at this point a circular or discoid fragment of bone separates gradually from the underlying epiphyseal bone over a period of months or years. Both the cavity and the loose body become covered with fibrocartilage. The defect in the bone may remain as such or may fill in gradually after complete separation has taken place.

There are three types in which the loose body may be found: retained in the original bone cavity, loose in the joint, or attached to synovial villi. Microscopically the findings in the excised specimen are reported either as chronic inflammation or septic necrosis.

The history is that of soreness, stiffness, and occasionally locking of the involved joint over a period of several years. Locking is common and may occur in patients who are incomplete as well as complete separation of the fragments. Although there is a group in which the onset is acute and in which the involved joint is painful, tender and often objective signs are usually few.

The diagnosis has been made roentgenographically in the great majority of cases. The changes are best seen in the anteroposterior roentgenogram and may be completely overlooked in the lateral view. The defect is usually shallow and hardly deeper than the typical location. It is usually circular in outline and

the immediately adjacent bone shows a narrow zone of increased density. This defect may contain a separated or hinged fragment of bone, partially decalcified, or it may be entirely empty.

The condition must be differentiated from synovial osteochondromatosis in which there is a tendency to form multiple loose bodies with no defect in the underlying bone, from a traumatic loose body in which there is a history of preceding severe trauma, and from tuberculosis of the knee in which the symptoms are much more severe. In the last condition the joint usually has a generally obscured appearance, there is a much greater degree of atrophy, the location of the process is different, and the sequestrum is increased in density. Other lesions from which the condition must be differentiated are a torn medial meniscus, hemophilic joints, and the defects of skeletal tophi in gout.

The treatment of choice is surgical. In the presence of symptoms, the majority of workers agree that radical extirpation of the detached or partially detached fragment, with or without curettage of the bony bed, is the ideal treatment. The results are uniformly good. The authors report 3 cases.

HAROLD C. OCHSNER, M.D.

Hsu, C-L, and Ma, W. C. Direct and Indirect Effects of Roentgen Radiation on the Blood-Forming Organs of Rats. *Am. J. Cancer*, 1940, 39: 319.

After a brief review of the findings reported by others on the direct and indirect effects of roentgen

irradiation on blood forming organs, the authors present the results obtained by them from experiments on rats. They subjected the posterior surface of one hind leg of normal albino rats to daily doses of 125 roentgens of filtered rays of an effective wave length of 0.315 Å, until from 1,000 to 5,000 roentgen units had been given to different animals. Histological changes in the irradiated and unirradiated bone marrow, lymph nodes, and spleen are recorded.

The irradiated bone marrow showed (a) increase of fat cells, (b) hypoplasia of erythrocytes in active proliferation, and (c) hypoplasia of leucocytes. In the unirradiated bone marrow, the changes were (a) increase of fat cells, (b) hyperplasia of erythrocytes, and (c) hypoplasia of leucocytes. The prominent change in the submaxillary nodes is a reduction of the cortical thickness and a corresponding expansion of the medullary area. There were also changes in the cell types varying with the dosage of radiation. In the spleen, the bulk of the white pulp decreased and that of the red pulp increased in correspondence with the amount of radiation to which the animal was exposed. All of these changes are discussed at length and with quite a bit of detail.

In conclusion it is stated that the findings demonstrated that when an animal is irradiated locally, hypoplastic or aplastic changes are found in the irradiated bone marrow, and compensatory hyperplastic changes in the unirradiated hematopoietic system.

ADOLPH HARTUNG, M.D.

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CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Seize H., Domsz C., Bassett, L., and Whittaker J.
On the Therapeutic Value of Adrenal Cortical
Hormones in Traumatic Shock and Allied Con-
ditions. *Canadian J. for J.* 94 43

The authors define a syndrome occurring in experimental animal exposed to damaging agent that they name the alarm reaction. This includes the entity of traumatic shock and recovery phase which they term the shock phase. During the shock phase there is a loss of muscular tone, decrease in body temperature, decrease in blood volume, with transudation of plasma into the tissue spaces, anuria, a rapid fall in blood chlorides and often also in blood sugar, hemorrhages at the gastro-intestinal tract, and other changes considered typical of shock. In the second phase many of these changes disappear or are reversed, and certain morphological changes occur, the most pronounced of which is marked enlargement of the adrenal cortex. Associated with the adrenal enlargement there is severe atrophy of the thymus and a lower degree of other lymphatic organs. The blood chlorides and blood volume tend to rise, bowe normal, and diuresis is excessive. Since adrenalectomized animals fail to develop clear-cut countershock response and have very low resistance against damaging agents, and since the adrenal glands reveal signs of increased activity during the shock phase, the authors conclude that these play an important rôle in shock defense. Furthermore, they have found characteristic histological changes in the adrenal glands of the rat. The cortical cells discharge their lipid granules and become enlarged, and mitotic proliferation of these cells occurs. The adrenal medulla loses its chromaffin granules. The eight out of size of the glands are greatly increased, and the greater the adrenal enlargement the more pronounced is the thymus involution. Such changes follow damage by a variety of noxious agents. While adrenalectomized animals develop all other signs of shock readily, the thymus fails to involute during exposure to damaging agents. The authors conclude that adrenal hyperactivity and thymus involution are both parts of the same general defense reaction against trauma.

The question then arises as to what part of the adrenal gland is essential for shock defense. Cannon and Clark would indicate that adrenaline is the hormone involved. Other workers found that in adrenalectomized animals which are very sensitive to histamine the histamine resistance is increased by the administration of adrenaline. The effect of cortin on histamine resistance is moot question. The authors' experiments indicate that large doses of adrenaline fail to cause thymus involution. Adrenalectomized rats while cortin in adequate

dosage is effective in this respect, also that the side effects of adrenaline in the adrenalectomized rat are counteracted by cortin. They therefore believe that increased cortical secretion is responsible for the defense reaction in the shock phase.

Adrenal cortical therapy has been reported of value in raising shock resistance and has been reported of benefit in many conditions allied to shock. Because cortical hormone therapy appears to be beneficial in so many conditions, it is considered that in organisms exposed to damage there is resulting relative adrenal insufficiency. The clinical reports of cortin therapy in surgical shock point in the same direction but so far cortin has not been used without the simultaneous administration of other therapeutic agents clinically.

In order to evaluate adrenal cortical therapy, carefully controlled animal experiments are carried out. Shock as produced by partial hepatectomy by subcutaneous injection of formaldehyde or by the crushing of parts of the gastro-intestinal tract. A comparative study was made of the effects of desoxycorticosterone and cortin (cortical extract), respectively, and a further study of the value of different methods of administration of cortin. Criteria used were the blood sugar, blood-chloride and hemoglobin values. It was found that desoxy corticosterone alone was inactive and with high doses actually harmful. Cortin was found to be of significant value in combating shock and was most effective when given in divided doses. Prolonged pretreatment with cortical preparations caused adrenal atrophy and had cumulative beneficial effect. Pretreatment, therefore, might possibly be harmful. Since the cortin contained both desoxy corticosterone and corticosterone and the former as found inactive alone, it appears likely that the latter is responsible for the shock-combating effects of the cortical extracts used. JAMES L. LEECH, M.D.

Brooks, B., and Duncan, G. W. The Effect of Temperature on the Survival of Aortic Thrombi
Can J Surg 49, 20

This treatise deals with the effects of temperature on the preservation of the viability of part of a normal segment of a circulation. In previous work the authors had found that if rat tails were subjected to constant pressure of 3 mm. of Hg for a period of eighteen hours at room temperature massive gangrene occurred invariably at eighteen hours. The time factor was constant and sharply defined. In the present work the same apparatus was used with the addition of an apparatus for the maintenance of constant temperatures within the range of 5 to 40°C.

Temperatures chosen for experiment were 5, 5°, 5, 30, 35, and 40°C. Under constant pressure of 3 mm. of Hg successful groups of rat tails

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were subjected to each temperature until the length of time for uniform production of gangrene was determined. The result of the experiments is summarized in the following table

TABLE I—DURATION OF ANEMIA NECESSARY FOR PRODUCING GANGRENE AT VARIOUS TEMPERATURES

Temperature Degrees Centigrade	Number of Hours
1	96+
5	96
15	48
30	14 to 16
35	8 to 10
40	3 to 4

Microscopic sections were made of tails in which gangrene had not occurred. These sections showed marked fibrous replacement of muscles in those instances in which the maintenance of low temperature had prevented the occurrence of gangrene.

The authors emphasize that the results of their experiments are not adequate evidence for the immediate acceptance of refrigeration of extremities in clinical medicine. In the first place, although low temperatures prevented massive necrosis, yet muscles and nerves underwent extensive fibrous replacement. Further, the conditions of the experiments are unlikely to be duplicated in clinical medicine. Consequently, the possible beneficial effect of refrigeration in preventing gangrene will be solved not by laboratory experiments, but by statistical data derived from clinical trial.

Before the adoption of refrigeration as a method for the maintenance of viability of free transplants of tissue, such as skin grafts, it will be necessary to know the influence of refrigeration, not only on the preservation of viability, but also on various factors involved in the healing of wounds.

LUTHER H. WOLFF, M.D.

Borson, H. J. Clinical Application of the Thiochrome Reaction in the Study of Thiamin (Vitamin B₁) Deficiency. *Ann Int Med*, 1940, 14: 1

The fluorescence developed by thiamin in urine when treated with ferricyanide (Jansen) was estimated against a standard in a simple comparator, and then the urinary concentration of thiamin in 18 normal subjects, 13 patients with thyrotoxicosis, 9 patients with typical deficiency neuritis, 26 patients with peripheral neuritis of unknown origin, 14 patients with multiple sclerosis, 4 patients with central-nervous-system lues, 11 patients with tic douloureux, 13 patients with miscellaneous neurological and mvopathic disorders, 28 patients with various matoid arthritis, and 20 patients with various gastro intestinal diseases was determined. Many of these patients were found to have an abnormally low excretion of thiamin.

PAUL STARR, M.D.

Wright, I. S., and Ludden, J. B. Treatment with Vitamin C (Cevitamic Acid-Ascorbic Acid). *Med Clin North Am*, 1940, 24: 743

As a test for Vitamin C saturation, the authors recommend the intravenous injection of 1 gm of ascorbic acid and the determination of the quantity present in the urine after one and one-half and five hours following the injection. Data are given which support the reliability of the test, and the indications for Vitamin C therapy are discussed.

PAUL STARR, M.D.

Latapi, F., and Leon y Blanco, F. Initial Lesions of Pinto. A New Dermatitis (Las lesiones de principio del mal del pinto una nueva dermatosis). *Med rev mex*, 1940, 20: 315

The authors state that the initial lesions of pinto were known to the inhabitants of the pinto-genous regions of Mexico, but were not accepted as such by those who studied the disorder. Pinto used to be considered a fungus disease, but the discovery of the presence of a spirochete by Herrejón and of a regularly positive Wassermann reaction has lately established the spirochetal nature of the disease. However, the clinical characteristics of the supposed initial lesions, which differed greatly from those of pinto, the inconstancy of the Wassermann reaction in their presence, and their disappearance under local treatment prevented their recognition as such, even by Herrejón.

Light was thrown on the question when one of the authors inoculated himself intradermally with serous fluid from the dyschromic skin of pinto, rich in Herrejón's spirochetes. He found that, after the initial papule, erythematous squamous lesions appeared instead of the expected classical dyschromias, and that these lesions were identical with those claimed by the people to be the initial lesions of pinto. In all subsequent inoculation experiments, the same lesions, accompanied by the presence of the spirochete of Herrejón, were observed. This led to a study of about 250 cases of initial lesions found among the population.

In the experiments a roundish, slightly elevated pink papule formed at the point of inoculation at about the seventh day and reached its fullest development about the twentieth day, when small scales appeared on it. About the thirtieth day, the elevation disappeared and the lesion took the aspect of an erythematous squamous round patch having a diameter of 1 cm. The lesion increased in size by continuous eccentric growth or by eruptions of other papules at its periphery which later fused with the first one, the increase being slow so that a diameter of about 3 cm was reached after two or three months. Generalization of the condition began after from three to nine months and consisted of the appearance of a varying number of roundish, pink spots which in one or two weeks acquired a ham-like color in white subjects and became covered with scales to acquire later the characteristic appearance of pinto. The Wassermann reaction remained negative while

the initial lesion was single and became positive some time after dissemination had started.

The study of cases among the population showed that the initial lesion was acquired between the ages of one year and thirty-six years, the average age being ten years. About 10-15% of the cases occurred in females and the other third in males. Personal contact with relatives having the disorder was blamed for its acquisition in 10-15% of the cases. Those who remembered the initial lesion stated that it had started as a single plaque located on the lower extremities in 80 per cent of the cases, on the upper extremities in 10 per cent and on the head and face in 5 per cent each. The uncovered areas of the legs, especially the external malleoli, were the sites of predilection. The lesions developed in the same sequence and time as those of the experimental cases. The distribution of the lesions was rather capricious and generally respected the covered parts of the body, the internal aspects and the regions of flexion of the extremities. Because of analogy with the cutaneous lesions of syphilis the authors propose the term of pitrids for these early manifestations of pinta.

The secondary pitrids are characterized successively by erythema, scaling, and dyschromia. Their number, size, form and color vary. Usually the center of the lesion regresses while the border is more active and polycyclic. There are no constant subjective and general symptoms. Macropolyadenitis as found in 65 per cent of the cases. Development of the dermatoma is very slow and dyschromia finally dominates the picture. The clinical forms are psoriasisiform plaque-like, epidermophytoid, syphilitic, leproid, and polymorphous. Herxheimer's spirochet was found in all cases and the Wassermann reaction as positive in 67 per cent, while eosinophilia as constantly present. Histologically the pitrids have no particular features. The differential diagnosis includes psoriasis, parakeratosis, epidermophytosis, syphilis, and leprosy. The prognosis is benign and the treatment consists of the administration of pentavalent arsenical by mouth, rapid results being obtained with stovarmol.

RICHARD KIEHL, M.D.

Hartman, J. B. and You, R. H. Muscle Lesions Stimulating Visceral Disease. *Lancet* 1910, 58

The authors summarized 24 cases in which an section of the back similar to rheumatic affections caused pain in the abdomen and chest and had led to an incorrect diagnosis of visceral disease. The mechanism of the referred pain as discussed in relation to recent work on deep pain sensation. The lesions are shown to have been in muscles.

The pain, its variations and associated phenomena were described. The syndrome was sufficiently characteristic to suggest the diagnosis. The object of physical examination was to find the painful focus to reproduce the symptoms by stimulating it, and to abolish them by means of local anes-

thetic. Treatment by infiltration of the lesions with procaine and the use of massage and exercise was effective and was therefore an essential part of the diagnostic procedure.

WALTER H. NADLER, M.D.

Vysotskaya, E. P. Heteroplastic Bone Formation. *Vopr. Khir.* 1913, 45, 3, 7

The majority of authors attribute the main rôle in bone formation to the periosteum and endosteum, but recently a number of them have focused their attention on the metaplasia of the connective tissue. For instance, Leriche showed that ossification took place in surrounding tissues after the mucous membrane of the urinary bladder had been brought into contact with small portions of another mucous membrane.

The author used heteroplastic, homoplastic, and autoplastic methods of transplantation of the mucous membrane of the urinary bladder in 3 dogs.

In the first series of experiments a strip of periosteum 1 cm. long was obtained from a femur of a dog. The strip together with a small portion of the wall of human urinary bladder as implanted in the muscles of the thigh of the same dog. Observations covering the period of one year failed to reveal any formation of bone by palpation, roentgenological examination, or histological studies. A transplantation of the mucous membrane of the human bladder without periosteum produced the same results.

The second series of experiments consisted of homoplastic transplantation. A portion of the wall of the urinary bladder as transplanted from one dog into the muscles of the thigh of another dog, but neither the histological nor the roentgenological examination was able to demonstrate any bone formation. In few dogs an ectopically obtained strip of periosteum as implanted together with a portion of the urinary bladder from another dog into the muscles of the thigh. No formation of bone followed.

In the third series of experiments on 3 dogs full thickness of the urinary-bladder wall as transplanted into the muscles of the thigh of the same dog. The diameters of the transplanted tissue were by cm. or by 5 cm. The tissue as implanted into the superficial layers of the muscle. One week after the transplantation an induration could be palpated. Three weeks after the operation a formation 3 by 4 cm. or even 4 by 5 cm. with the consistency of bone could be felt and roentgenograms disclosed shadows of osseous tissue. Histological examinations performed six months, half a year and sixty days, six months and one year after the transplantation showed in all cases except formation of new bone in the exceptions suppuration occurred the dissection showed oval shaped cysts, closely adherent to the surrounding muscles. With the cysts dense formations could be felt. After incision through the cysts brown liquid or a jelly like substance escaped. The inner wall of the

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cysts was covered with bone tissue which had an irregular surface, forming tuberosities or trabeculae. In all cases in which after autotransplantation of the wall of the urinary bladder a bone formed, increased calcium and phosphorus contents of the blood were found. The author is inclined to believe that blood furnished the calcium necessary for the formation of the new bone. A similar rise of the calcium and phosphorus contents of the blood can be observed after fractures in which cases it lasts until the consolidation of the fragments has become complete.

The histological studies showed a prolific development of epithelium in the region of transplantation. The basophilic staining supported the view that the epithelium was newly formed. Formation of the osseous tissue was taking place at the side opposite to the transplanted portion of the urinary bladder, in other words, the bone was not forming from the connective tissue of the urinary bladder. The new bone was located immediately underneath the epithelium. Apparently the transplanted epithelium possessed osteogenic properties. Cells in the osteoid tissue had an appearance identical with that of the epithelial cells adjoining the bone. Therefore, the author supports the hypothesis of a transformation of the epithelium of the urinary bladder into osseous tissue. The peculiar osteogenic property of the mucous membrane of the urinary bladder may find an application in the treatment of ununited fractures.

JOSEPH K. NARAT, M.D.

Lloyd, H. L. Tumors Related to Cartilaginous Growth. *Am J Surg*, 1940, 49: 221

A survey of tumors related to cartilaginous growth is presented with emphasis on the similarity of these lesions to the generalized type of osteitis fibrosa cystica, which suggests a relationship to the endocrine mechanism. Stress is placed on the fact that these neoplasms occur at certain ages, the activity of the osteoclast and its ability to become malignant or benign depending on its stimulant.

It is the growing opinion of many that neoplasia is a mechanism transmitted as a recessive character by heredity, fixed in the tissues to appear at a certain period of the individual's development if the individual survives. The group of bone tumors reported by the author serve as excellent illustrations of this theory.

The average age of 14 patients with bone cysts was thirteen and six-tenths years. The characteristic features of the roentgenograms were an ununited epiphysis, metaphyseal location, and a central area of bone destruction crossed by trabeculation. If there had been a fracture, a dense shadow of new bone was seen. There was a fibrous tissue lining and the contents were fluid, fibrous or grumous material, or an admixture of all. Fibrous trabeculation could be felt, there was multiloculation and, occasionally, bone spicules. When a bone cyst occurred at a site where multiple centers of ossification were present, it might take on many of the characteristics of a

giant-cell tumor and tend to progress. However, it was metaphyseal in location. The line of demarcation between the single bone cyst, the giant-cell variant of bone cyst, and polycystic osteitis fibrosa was by no means sharp. The histology was similar and patients might be found who are difficult to classify.

The average age of 22 patients with giant-cell tumors was twenty-eight years. The characteristic x-ray features were asymmetrical location in the epiphysis, osteolysis, and expansion centrally at the expense of cancellous bone. Traheculation was seen, but there was no periosteal reaction. The fibrous tissue lining resembled that of bone cysts and the contents were usually hemorrhagic, oozing blood, friable, and of fibrous trabeculations. Bone spicules were palpable. Some giant cell tumors were practically indistinguishable from osteitis fibrosa cystica. Giant cell tumor is occasionally found in the vertebrae and may then cause symptoms of cord compression. When a giant-cell tumor is present directly beneath the periosteum, it may pulsate. Its rate of growth may be very rapid and cause perforation of the cortex. A mistaken diagnosis of osteogenic sarcoma is often made in such cases and amputation performed when more conservative therapy would have sufficed. Malignant giant cell tumor is of two types that which recurs locally and that which metastasizes. Although giant-cell tumors have a tendency to recur locally, this is usually due to incomplete removal, poor selection of treatment, or both. Metastatic tumors are usually mistaken diagnoses—the lesion is an osteolytic sarcoma rather than a giant-cell growth.

Given factors that will produce an environment favorable to the existence of the giant-cell and unfavorable to the processes of repair, one may expect the formation of a giant-cell tumor. Hyperparathyroidism producing a calcium deficiency of bone will jeopardize the process of repair and permit the osteoclast to proliferate. Trauma may have a similar but less marked effect. Bleeding into bone when the only factor present to stop the bleeding is a pressure equivalent to the systolic blood pressure may, in a hemophilic, give a similar picture.

JOSEPH K. NARAT, M.D.

Leighton, W. E., and Schmidke, E. C. A Single Trauma as an Etiological Factor in Carcinoma. *J Missouri State M Ass*, 1940, 37: 267

The relation of a single trauma to the onset of malignancy has assumed great importance in recent years, not only as an academic question but more especially as a medicolegal one. From a medicolegal standpoint, the relation of a single trauma to malignancy seems to have been fairly well established in most courts and compensation bureaus, when the conditions laid down by Segond are applicable to the case in question.

In 1907, at the French Congress of Surgeons, Segond read his classical paper on the subject of trauma in relation to malignancy. He presented

the following 6 postulates (1) the authenticity of the trauma (2) sufficient importance or severity of the trauma (3) reasonable evidence of the integrity of the part prior to the injury (4) correspondence of the tumor to the site of the injury (5) date of appearance of the tumor not too remote from the time of accident to be reasonably associated with it and (6) diagnosis established by clinical and roentgen ray evidence supported when possible by microscopic examination.

After a review of the literature on this controversial subject, supplemented by several illustrations of the opposing view, the author presents 70 case histories from the records of The Bernard Free Skin and Cancer Hospital, St. Louis, of superficial cancers initiated by single trauma which are not biased by any medicolegal phase. While no one believes that trauma in itself produces cancer, it apparently does set off something, and the author believes from his clinical experience that in certain cases trauma is the inciting cause or instigator of the cancer.

Joseph K. Narat, M.D.

Batson, O. V. The Function of the Vertebral Veins and Their Role in the Spread of Metastases. (*Ann Surg* 94 38)

Paradoxical metastases of abscesses and tumors appear regularly in locations that do not follow a line of direct spread from their focus. The roentgenologist suggests a diagnosis of primary carcinoma of the prostate when he detects a typical distribution of bone lesions involving the pelvis.

The author believes that the explanation of these typical and peculiar metastatic lesions has been inadequate. They resemble the pattern of spread of the related involved nervous sheaths and lymph vessels are responsible. Histories. The only anatomic system into which this pattern fits is the system of veins which in its plexiform ramification infiltrates and invests the sacrum, the lumbar spine and the adjacent wings of the ilia. The architecture of this plexus of veins is demonstrated experimentally by utilizing the dorsal vein of the penis which has direct communication with the prostatic plexus.

Weber King, a flow artist tube technique as injected into the dorsal vein of the penis in recumbent adult cadavers. The effect of the injections as observed under the fluoroscope and with roentgen films. The direct connections between the penile dorsal veins, prostatic plexus, vessels of the lateral pelvic wall, common iliac vein and inferior vena cava are easily demonstrated in stereo-collage films of the pelvis the material was followed into the bone, wings of the ilia and into the sacral canal. These films are exact replicas of the pattern made by early carcinoma of the prostate.

In order to secure better injection of the smaller vessels, thinner solution (Weber's first technique) as used. With the same technique and the use of larger amounts of solution, this pelvic pattern is more clearly reproduced and there was no filling of the canal system. The author

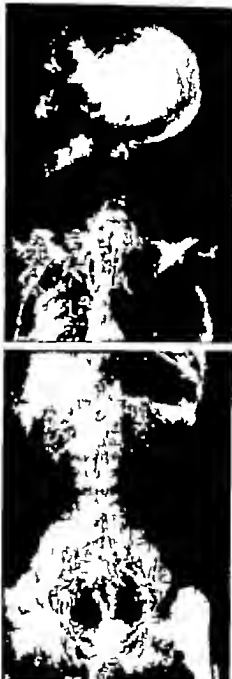


Fig. Composite roentgenogram of small male cadaver. Injection of radiopaque material into deep dorsal vein of penis. Note external cranial vein injection. (Courtesy of J. B. Lippincott Co.)

MISCELLANEOUS

Lake, N C. *Chemotherapy in Surgery* Proc Roy Soc Med, Lond, 1940, 33 601

was surprised to note the successive and extensive filling of the vertebral veins extending into the veins of the cranial cavity (Fig 1). Filling of some of the intercostal veins and verte vasorum of the femoral vessels was also noted. This method of venous injection has been used routinely in the preparation of male cadavers for dissection in the laboratory. By this method, veins and sinuses of the cranial cavity, such as the superior longitudinal sinuses, the cavernous sinus, and others, are usually found to be fairly well filled.

These experiments were repeated in a living monkey by the injection of colloidal thorium dioxide into the dorsal veins of the penis under aseptic technique. The x-ray films showed the material passing by way of the lateral pelvic wall veins into the vena cava. To simulate daily increase of intrathoracic and intra abdominal pressure, due to exercise, coughing, or sneezing, a towel was tied around the abdomen of the monkey, and the injection repeated. With the increase of intra-abdominal pressure, the films showed only a partial filling of the caval system. The vertebral system including vessels of the thoracic spine and lower intercostal veins was now visualized. In this manner injections of the human cadaver were duplicated in the living animal under physiological conditions and it was shown that the injections in the cadaver were not artifacts.

The breasts of female cadavers were similarly injected and roentgenograms were taken. With the injection of 30 c cm, material was found in the clavicle, intercostal veins, head of the humerus, cervical vertebrae, transverse cranial sinuses, and even in the superior longitudinal sinus. Some of the dye was also noted in the azygos vein and in the superior caval system. The results of these experiments tend to explain the aberrant breast metastases as secondary involvement of the shoulder girdle, vertebrae, ribs, and skull bones.

The author suggests that the term "vertebral veins" be added to the recognized caval, pulmonary, and portal systems. Developmentally, this system is derived from segmental components. It has retained its primitive character as shown by the absence of valves, plexiform channels, reduplications, and rich anastomoses. This system also has free communications with the body cavities and walls at each intervertebral space. Studies of these vessels in the cadaver, in experimental animals, and at the operating table indicate that they are "storage lakes" as well as drainage pathways. The veins of this system are thin-walled, which indicates that the contents are under low pressure.

The rôle of the vertebral vein system explains most cases of aberrant malignant metastases, aberrant pyogenic metastases, and aberrant embolism following injections of air.

On the basis of these investigations, the venous system is known to consist of the caval, pulmonary, portal, and vertebral divisions.

Lake, N C. *Chemotherapy in Surgery* Proc Roy Soc Med, Lond, 1940, 33 601

It has long been known that the azo dyes have a relatively powerful bactericidal action *in vitro*. Recently, azo compounds with a sulfonamide group have been shown to have a definite therapeutic effect upon experimental streptococcal septicemia of mice, and a series of such products was developed. These compounds were not devoid of toxic effects. Thereafter it was found that the azo arrangement was not essential, but that the colorless and comparatively simple compounds containing a sulfonamide group were equally or even more active. It was also suggested that when products of the azo dye type enter the body a breakdown occurs, which liberates simpler substances of the amino-sulfonamide type, and the latter alone are responsible for the bactericidal activities.

There is at present available a large series of products of a similar nature: prontosil, rubiazol, sulfanilamide, and sulfapyridine.

These are chiefly in use against streptococcal and diplococcal infections. In addition, certain products having a different side linkage have been evolved, for which anti-staphylococcal action is claimed: uleron and albuclid.

Experiments prove that these compounds have a powerful effect against hemolytic streptococcal infections. Some of them are particularly active against the diplococcal group of organisms. One or two of them are effective against staphylococcal infections. Gas gangrene infections with the clostridium welchii and clostridium septicum yield to certain of the preparations, but the clostridium oedematiens is very resistant to all of them. All of these compounds are without effect upon the virus diseases.

Clinical results agree fairly closely with the experimental results as far as the specificity of the various compounds is concerned. Plain sulfanilamide, under its various synonyms, is effective against hemolytic streptococcal infection, but it is of little value against other more resistant streptococci, particularly those of the fecal type. It is of no use in staphylococcal infections. This specificity of action is demonstrated in cases of mixed infection, in which the sensitive organisms are destroyed while the others may get a firmer footing.

In cases of empyema, the use of sulfanilamide and, especially, of sulfapyridine forms a useful addition to, but not a substitute for surgical treatment.

In staphylococcal infections the results are less remarkable. Outstanding among these are those in acute osteomyelitis. In view of the specific action of the chemotherapeutic materials, it is not surprising that both sulfanilamide and sulfapyridine are of little value in this condition. Uleron, however, is effective frequently. When given in the early stages of osteomyelitis, uleron usually causes a disappearance of the signs and symptoms in three or four days, and in many of these cases no need for surgical interference arises.

LEANDER W. RIBA, M D

The chemotherapeutic products can completely replace older forms of treatment in many instances but their use does not preclude the use of other appropriate treatment also. Thus, vaginal drainage and serum are employed in addition to chemotherapy.

SURGEON KAM M.D.

DUCTLESS GLANDS

Dorfman, R. I. Wilson, H. M., and Peters, J. P.
Differential Diagnosis of Basophilism and Adrenal Conditions. *Endocrinology* 940, 1

In this report the authors present criteria from review of the literature and study of a series of cases by which the basophilic and cortico-adrenal syndromes can be distinguished from one another and from arrhenoblastoma. Fourteen cases were studied. Evidence of basophilism was found in 3 cases at autopsy. Bilateral adrenal hyperplasia was found in 1 patient who had had no ovarian pathology at previous exploratory laparotomy. All of the cases were observed for disorders of habitus and circulation, of metabolic function, of genital development, and of sexual development and function. The results of these observations are grouped and classified as shown by the accompanying table.

The general habitus and circulatory disorders of basophilic and cortico-adrenal syndromes are indistinguishable in adults. Obesity of the face and trunk, purple true ecchymoses, rubicundity of the face and acneiform eruptions are found in both. Cases of cortico-adrenalism in children in which some or all of these stigmata were lacking have been reported. If obesity is present in cases of arrhenoblastoma, it does not usually assume the char-

acteristic basophilic pattern, nor is it attended by rubicundity and purple striae. A diminished carbohydrate metabolism and osteoporosis are common disturbances of the metabolism in cortico-adrenalism as well as in basophilism, but they are not seen in cases of arrhenoblastoma. In the female, hirsuties and amenorrhea occur almost invariably in all three syndromes. In children virilism manifest itself unmistakably and thus far it has been observed only in conjunction with adrenocortical tumors or with arrhenoblastomas. In the developmental period, cortico-adrenalism gives rise to precocious development not only of the sexual organs but of the body as a whole, as demonstrated by an advanced bone age and an increased rate of growth until epiphyseal union takes place. Excessive quantities of urinary androgens are found in patients with adrenocortical tumors. This material has been found to be dehydro-iso-androsterone. Urines assayed for estrogenic activity in this series proved to be consistently normal. RICHARD W. RAWSON, M.D.

Hall, K. J. Changes in the Adrenal Glands of Gonadectomized Male and Female Rats Produced by the Prolonged Injection of Sex Hormones. *J. Path. & Bacteriol.* 940, 5, 75.

This article describes the histological reactions of the adrenal glands in gonadectomized male and female rats produced by the injection of sex hormones.

The experiments were carried out on the average for one hundred-day periods. Eighty-eight male and female rats were gonadectomized in the course of the work. Thirty male and female rats were kept intact as controls. Gonadectomy as

TABLE I.—DISORDERS OBSERVED IN THE CASES STUDIED

Function	Basophilism	Cortico-adrenalism	Arrhenoblastoma
<i>Habitus and Circulatory Disturbances</i>			
Obesity	Face and trunk	Face and trunk	Not characteristic
Purple striae	Usual	Usual	Rare
Ecchymoses	Common	Common	Absent
Rubicundity	Usual	Usual	Absent
Acne	Common	Common	Not characteristic
Hypertension	Frequent	Usual	Absent
<i>Metabolic Disorders</i>			
Low carbohydrate tolerance	Common	Common	Absent
Osteoporosis	Common	Common	Absent
<i>Developmental and Sexual Functions</i>			
<i>Male</i>			
Libido	Normal or diminished	Normal or increased	
Sexual development	Retarded	Precocious	
<i>Female</i>			
Libido	Normal or reduced	Normal or Reduced	Normal or reduced
Menstruation	Abolished	Abolished	Abolished
Hirsutism	+	+	+
Genital function	Diminished	Masculinized	Masculinized
Genital organs	Normal or atrophic	Hypertrophy of clitoris	Hypertrophy of clitoris
Sexual development	Retarded	Precocious	Precocious
Children	Retarded epiphyseal union	Precocious epiphyseal union	Precocious epiphyseal union

performed during the fourth week of the animals' lives. Male hormones were injected five times a week, progesterone six times a week, and estradiol esters three times a week. Castration in males produced a slight narrowing of the zona glomerulosa with increase of the lipid droplets, and hyperemia in the zona reticularis. There was a slight tendency toward hypertrophy of the zona reticularis and fasciculata. In the female no constant change in size was observed, the zona glomerulosa appeared slightly atrophic concomitantly with a similar atrophy with hyperemia of the zona reticularis.

The effect of female hormones was to exaggerate the slight changes produced in the zona reticularis and glomerulosa following the gonadectomy, namely, atrophy, fibrous replacement in the zona reticularis, narrowing of the glomerulosa, and a generalized decrease of lipid in the cortex. In the zone between the medulla and cortex, islets of reticularis cells, not separated into columns, were preserved, these are called "reticularis boundary cells" by Korenchevsky.

The male hormones in both sexes tended to nullify the effect of the gonadectomy. There was a return toward normal in the size and structure of the adrenal glands. An interesting sidelight was observed: prolonged injection of the male sex hormones produced less effect than similar experiments of shorter duration, which suggested that a resistance or neutralizing effect had developed.

The simultaneous injection of both male and female sex hormones seemed to indicate that male hormones nullified in part or completely the action of the female hormones, testosterone esters being the strongest in this respect while dehydro-androsterone was the weakest. STANLEY ROBBINS, M D

Payne, S., and Shelton, E. K. Stilbestrol A Synthetic Estrogenic Preparation. *Endocrinology*, 1940, 27, 45

This is a report of 80 patients treated with synthetic stilbestrol, (4,4-dihydroxy-A, B, diethyl stilbene) and followed up for periods of from three to eight months. Several of these patients had been under observation for several months previously while receiving natural estrogens. Each patient was studied carefully before treatment and in most instances blood counts and vaginal smears were repeated at frequent intervals during the period of observation. Stilbestrol was found to be markedly estrogenic. Six girls with delayed adolescence began to have fairly regular menstrual cycles following from five to thirteen weeks of continuous treatment. Fourteen young patients with infrequent scanty menses had a more profuse, prolonged, and regular catamenia following treatment. Lactation was inhibited in 4 women following delivery. Menopausal symptoms were remarkably promptly relieved in 42 women. The untoward effects included nausea, anorexia, and scotomas. One patient showed evidence of liver damage, as demonstrated by a decrease in the hippuric-acid excretion.

The authors conclude that stilbestrol is a potent estrogenic preparation which is effective by mouth as well as by parenteral administration, and while the untoward reactions reported may be due to overdosage, extreme caution is warranted in its use until after more intensive study of its toxicology has been done. RULON W. RAWSON, M D

Bonser, G. M., and Robson, J. M. The Effects of Prolonged Estrogen Administration upon Male Mice of Various Strains. Development of Testicular Tumors in the Strong A Strain. *J. Path. & Bacteriol.*, 1940, 51, 9

An experiment is described which demonstrates the response of three strains of male mice to the administration of estrogen for periods as long as two years. Only the mice belonging to the R III strain developed mammary carcinomas with a frequency of approximately 60 per cent, whereas none of those belonging to the other two strains demonstrated this change. In the same strain, treatment with triphenylethylene produced scrotal hernias, the Strong A strain occupied an intermediate position between the other two.

With regard to testicular tumors, the Strong A males showed the only tendency toward the development of interstitial testicular hyperplasia, and, ultimately, after from fifty to seventy weeks of treatment definite tumor nodules were noted. The tumors occurred in the center region of the testis and histologically satisfied the criteria of a malignant tumor. However, attempts to graft these tumors into the same animal and other young animals were unsuccessful.

Significant changes, namely, "brown degeneration," were noted in the adrenal glands in all three strains, most prominently in R III. The authors suggest that a correlation appears to exist between the development of "brown degeneration" of the adrenal gland and of mammary cancer in the R III strain.

In addition, the hypothesis that certain testicular tumors may develop as the result of increased estrogen production in the male gonad is presented and discussed. The importance of the genetic constitution in the development of experimental tumors is reemphasized by the limitation of the testicular tumors to one strain of mice.

STANLEY ROBBINS, M D

Aycock, W. L. A Subclinical Endocrinopathy as a Factor in Autarceological Susceptibility to Poliomylitis. *Endocrinology*, 1940, 27, 49

The author presents limited epidemiological evidence that the virus of poliomyelitis is widespread but that the occurrence of the disease in those exposed to the virus is limited and selective. The determining factor between clinical and subclinical poliomyelitis resides in the host. The author suggests that this factor is inherent, and because of the seasonal and geographic tendencies it is physiological rather than anatomical.

Photographs of a group of patients from on poliomyelitis clinical are presented to demonstrate that a constitutional type of disease, which appears to be the result of an endocrine dysfunction, is common in these patients. In a few of the suspected selectivity in the occurrence of poliomyelitis during pregnancy and because of the implication of the nasal mucosa as a portal of entry of the virus the author suggests that estrogenic substances are concerned in the selectivity of the disease.

Studies are reported. In the first, castrated monkeys and castrated monkeys that had received estrin before and during the virus treatment were given daily intranasal installations of poliomyelitis virus. The estrin treated castrated animals developed experimental poliomyelitis with less frequency than the control animals and the interval from the first installation of the virus to the onset of the disease was comparatively longer in this group than in the controls.

In a second study higher average excretion of estrogenic substances was found in a group of poliomyelitis patients than in a comparable group of normal individuals.

The writer concludes that these observations suggest that autoneurological susceptibility to poliomyelitis may lie in some fault in the economy of estrogenic substance. *Reflux W. R. 502, M. D.*

SURGICAL PATHOLOGY AND DIAGNOSIS

Rhodes, R. H. Capillary Permeability in Areas of Inflammation Produced by Xylene. *Arch. Surg.* 94, 4.

The capillaries in the skin of the rabbit show an increase in permeability for approximately three hours after local application of xylene. This is indicated by the localization of trypan blue, India ink, antitoxins and vaccine virus in such areas. The skin may show all the cardinal features of inflammation, and still these substances may fail to localize and concentrate in the tissue. The period for which capillaries are more permeable may vary with different irritants. This is shown by the fact that trypan blue when given intracutaneously localizes and concentrates in areas of skin into which a 4 per cent sodium chloride solution was injected intradermally sixty minutes prior to injection of the dye. This same dye localizes and concentrates in the skin of the rabbit where horse serum is injected intradermally when the latter is given as long as twenty-four hours prior to intravenous injection of the dye.

WALTER H. NADLER, M. D.

EXPERIMENTAL SURGERY

Rapfogel, I. The Effect of Testosterone Propionate upon the Skeletal Development of Eunuchs. *Endocrinology* 94, 27-79.

The case of a fifteen-and-one-half year-old eunuch is reported. His growth and body proportions were carefully observed during the 6-year period of

treatment with testosterone propionate. The boy presumably eunuch since the age of five years, showed the classical stature of such individuals. According to the method of Burgens, his height plotted against the general height range of his age and at the onset of treatment as at the 1 per cent level. This signified that of 100 boys of his age only one would be as short or shorter than he.

The testosterone propionate in oil, was administered intramuscularly and as treatment progressed his height was plotted against the expected growth curve for his age and height. During the two-year period of treatment, he progressed from the 1 per cent to the 30 per cent group. Marked stimulation of growth did not begin until dosage of 30 mgm. weekly had been maintained for several months.

The progression of the height from lower to a higher group level signified the presence of growth stimulating influence, which, in this case may have been the androgenic therapy. Since, in some instances, sudden and unexplainable spurt in the rate of growth may occur spontaneously about treatment of any kind, a definite relationship cannot be assumed between the androgenic therapy and the rate of growth as observed in this single instance. Nevertheless, the possibility of androgenic influence on the outcome of this case cannot be entirely excluded.

It has long been considered that potent androgenic therapy was antagonistic to the rate of growth, supposedly because of its inhibitory effect upon the anterior pituitary lobe. This case demonstrated that growth can be markedly accelerated during a period of androgenic treatment.

SAMUEL KARY, M. D.

Atkinson, D. W. A Review of Experimental and Clinical Trials of Stilbestrol. *Endocrinology* 94, 27-6.

Stilbestrol, 4,4-dihydroxy-alpha-beta-diethylstilbene is one of the synthetic estrogenic hormones related to the stilbenes and diphenylethane, which produces an even stronger effect in animals than the naturally occurring estrogens.

The potency of stilbestrol is 3 or 4 times greater than that of estrone. In addition, it has the advantage of being almost as potent orally as parenterally.

Stilbestrol is standardized according to the Allen-Douy method for estrogenic hormones. The amount which will produce estrus when given subcutaneously in fractional doses at eight-hour intervals to mature ovariectomized rats weighing from 4 to 5 gm. has been determined. Estrus must occur in 60 per cent of series of animals within from forty-eight to seventy-four hours. When standardized in this manner mgm. of stilbestrol has the same activity as 1,000 international units of estrone.

Irrespective of dose, excretion of the stilbene preparations begins approximately five hours after their administration and reaches its peak in twelve hours.

MISCELLANEOUS

It continues through the fifth day, therefore, this is the optimum time for injection of the second dose. If the fluid intake is restricted, the effect is somewhat prolonged. The short duration of estrus in experimental animals is evidence of the rapidity with which these drugs are excreted.

Experimentally, stilbestrol has been shown to be similar in action to the naturally occurring estrogens, even insofar as the ability to produce cancer is concerned. Clinically, its ability to control the symptoms of the menopause is unquestioned.

The dosage used in the administration of stilbestrol varies considerably. In one series, the dose ranged from 1 mgm per day for one week to 30 mgm per day for from two to three weeks. One patient received 1,320 mgm over a period of four months. However, the average conservative dose is 1 mgm daily by mouth or injection.

There is a great deal of confusion over the extent of the toxic effects of stilbestrol. Among the noted disturbances have been skin rashes, a case of acute psychosis, paresthesias, marked thirst, and purpuric manifestations. Granulocytopenia and anemia were noted in dogs receiving 5 mgm daily for from twenty-five to fifty days. Albuminuria and casts developed in 1 patient during treatment, while before treatment and at a later date the urinary findings were negative.

The possibility of liver damage has been the chief concern of most investigators, and numerous reports of moderate hepatic dysfunction have been made. In human beings, neither cases of severe toxic jaundice nor deaths have been reported. However, in studies on mice and rats, stilbestrol and estradiol are said to have caused death from liver damage when given in very high doses. The animals had marked icterus, and some of them had hemorrhagic pneumonia. The dose of stilbestrol varied from 1 mgm daily to single doses of 5 and 10 mgm. Estrone was found to be less toxic than stilbestrol or estradiol.

The value of the synthetic estrogens, as compared with the natural estrogens, lies in their lower cost and their high oral potency. If the toxic side effects can be reduced or eliminated by further chemical refinements, it seems probable that the natural estrogens will be eliminated in clinical practice, or that their cost will be reduced.

SAMUEL KAHN, M D

Barnard, W G, and Todd, E W. Lesions in the Mouse Produced by Streptolysins O and S. *J Path & Bacteriol*, 1940, 51: 43.

Todd has demonstrated two streptolysins clearly differentiated by their serological reactions (1938). These are Streptolysin O, which is oxygen sensitive, and Streptolysin S which is serum extractable. Streptolysin O can be obtained free from Streptolysin S but Streptolysin S always contains a certain amount of Streptolysin O. These streptolysins injected into mice produce distinctly different lesions. Streptolysin O injected intravenously into mice kills them within a few minutes or does not kill them

at all. The majority of those that died did so within three minutes, only 2 survived an appreciable time, 116 and 154 minutes, respectively. Because of the rapid death of the animals no definite parenchymatous lesions could be detected. In the mice surviving longest there were general venous engorgement and edema of the lungs. From the general appearance and rapidity of death it was thought that the cause was a substance similar to histaminase or the H substance of Lewis, this has not been confirmed up to the present time.

When large doses of Streptolysin S are injected into mice, they die within a few minutes. As the dose is reduced the survival time is lengthened. Since Streptolysin S always contains Streptolysin O, mice were immunized passively against Streptolysin O. All mice injected with Streptolysin S died, and all but 2 developed hemoglobinuria. The protective action of the Antistreptolysin O serum did not alter the lesion produced by Streptolysin S. The mice showed two kinds of lesions: (1) degeneration of the parenchymatous organs, and (2) laking of the blood throughout the body. The latter was seen particularly well in sections of the heart, in which the blood in the dilated right ventricle frequently appeared as a mass of homogeneous pink material in which few or no individual corpuscles could be seen. In later stages no red blood cells could be identified in the bone marrow.

Lesions produced by living streptococci were compared with those produced by the streptolysins. In only 1 mouse which survived forty hours was there any appreciable laking of the blood. Cloudy swelling of the parenchymatous organs was seen in all of the mice.

JOHN S LOCKWOOD, M D

Fuller, A T, Colebrook, L, and Moxted, W R. The Mode of Action of Sulfanilamide. *J Path & Bacteriol*, 1940, 51: 105.

The authors believe that the exact mode of action of sulfanilamide has not yet been discovered, principally because much of the work has not taken into account the many sided nature of the problem. Colebrook, Buttle, and O'Meara (1936) showed that sulfanilamide had a direct bacteriostatic action on the streptococcus. This direct action is exerted in blood and serum in the absence of any antibodies, and in semi-synthetic media. The curative action of the drug probably depends on it.

The importance of the medium used in the investigation of sulfanilamide action has not generally been realized and it is suggested that a study of the effects of the various constituents may give useful information.

In human blood the influences unfavorable to the cocci are antibodies and leucocytes. If the leucocytes are removed by filtration or inactivated by heat the blood can be considered simply as a culture medium. Experiments are reported to show that blood which can kill streptococci loses this power after being heated, but that sulfanilamide can exert a bactericidal power in this heated blood or in serum.

I defibrinated mouse or rabbit blood, sulfanilamide is practically without effect on hemolytic streptococci. This is because of the presence of a growth-stimulating factor in the red cells and because of defibrination which removes 30 per cent of the leucocytes from normal mouse blood, including the most actively phagocytic. This strengthens the favorable and weakens the anti-bacterial factors so markedly that sulfanilamide is without effect. Heparinized mouse blood is bacteriostatic for mouse virulent streptococci, and with the addition of 1 mgm. of sulfanilamide per 100 c.cm. it becomes bactericidal. This is because active leucocytes are not removed. Sulfanilamide is effective in curing streptococcal infections in mice because the reticulo-endothelial system aids in killing the streptococci.

The action of sulfanilamide in trient broth and in blood involves quite different considerations. Blood contains catalase which prevents the accumulation of peroxide. If broth there is no catalase and if peroxide is formed it may oxidize the sulfanilamide to hydroxylamine and azoxy products, and the bactericidal effects observed may be due to these products rather than to the drug itself (Bl yer 937). The authors were unable to detect any decrease in the sulfanilamide content of the culture when peroxide was formed, nor were they able to detect any hydroxylamine compound. Addition of hydroxylamine benzene sulfonamide up to 0 mgm. per 100 c.cm. did not prevent the growth of the test organism. Another evidence of oxidation is an elevated oxidation potential, but streptococci produce reducing conditions during active proliferation and any interference with growth could result in higher oxidation potentials.

In semi-synthetic media sulfanilamide prevented the growth of cocci, and the addition of 1 per cent of peptone neutralized the sulfanilamide effect just as it did in serum. Sulfanilamide was also bactericidal in medium rich in protein-breakdown products. This bacteriostasis could be prevented by the addition of protein. Thus protein interferes in peptone media, but it is not known why both protein and

peptone must be present to neutralize sulfanilamide action. The theory that sulfanilamide acts by interfering with the proteolytic enzyme of the streptococcus does not explain all the facts.

Extract of mouse blood and urine yeast extract and bacterial extracts all interfere with sulfanilamide action but only in the presence of protein. It is believed that while this is not an essential constituent for the growth of streptococci, it appears to be an essential factor when sulfanilamide is present. The authors note, however, that Woods obtained an anti-sulfanilamide effect with *p*-aminobenzoic acid in the absence of protein.

The authors were unable to confirm the claims of Lyons and his coworkers that sulfanilamide-containing media rendered the streptococcus more amenable to phagocytosis and more easily killed by human blood.

The action of sulfanilamide is relatively gentle. It acts decisively only in media in which the cocci grow imperfectly such as human blood and tissue fluids. This action is greatly influenced by the constituents of the medium, and those which interfere with the action of the drug also stimulate the growth of the cocci. The fate of streptococci in blood depends on the relative strength of the favorable and unfavorable influences, and in the presence of leucocytes and antibodies the cocci are killed more rapidly by sulfanilamide.

Addition of growth promoting substances enables streptococci to overcome unfavorable conditions, whether these are due to leucocytes, opsonic antibody, too high temperature lack of carbon dioxide, or sulfanilamide. There is similarity in all these effects in that peptone can prevent them, and it probably acts as a simple nutrient. In spite of the addition of growth-promoting substances the drug frequently causes considerable diminution of growth.

The results do not make it possible to say whether the drug acts on a particular enzyme system of the streptococcus or as a non-specific growth-depressant.

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